# PR 500

# MEASURER OF pH/REDOX and PANEL/WALL TEMPERATURE

## TECHNICAL MANUAL

# INDEX


**1 GENERAL ..... 1**

1.1 INFORMATION ON THE MANUAL ..... 1
*1.1.1 CONVENTIONS ..... 1*
1.2 DECLARATION OF RESPONSIBILITY BY THE MANUFACTURER ..... 2
1.3 LIMITS OF USE AND PRECAUTIONS FOR SAFETY ..... 2
*1.3.1 ELECTRICAL SAFETY ..... 2*
*1.3.2 SAFETY OF THE OPERATIVE ENVIRONMENT ..... 3*
1.4 GRAPHIC SYMBOLS ..... 4
1.5 CAUTION SYMBOL ..... 4
1.6 PLATE DETAILS ..... 5
1.7 INFORMATION ON RECYCLING AND USE OF MATERIALS ..... 5
*1.7.1 SPECIAL ATTENTION TO CRITICAL COMPONENTS ..... 5*

**2 GENERAL DESCRIPTION ..... 6**

2.1 MEASURING PRINCIPLES ..... 6
*2.1.1 PH MEASURER ..... 6*
*2.1.2 REDOX MEASURER ..... 6*
2.2 MAIN CHARACTERISTICS ..... 7
*2.2.1 TECHNICAL CHARACTERISTICS FOR PH MEASURING ..... 8*
*2.2.2 TECHNICAL CHARACTERISTICS FOR REDOX MEASURING ..... 8*
*2.2.3 TECHNICAL CHARACTERISTICS FOR MEASURING OF SECONDARY TEMPERATURE ..... 8*
GRAPHIC DISPLAY ..... 9
*2.2.4 LIST OF PRIMARY MENUS ..... 9*
*2.2.5 DIVISION OF THE GRAPHICAL DISPLAY INTO AREAS IN THE RUN METHOD ..... 10*

**3 INSTALLATION ..... 13**

3.1 COMPOSITION OF THE SUPPLY ..... 13
*3.1.1 INSTALLATION OF WALL MOUNTED GEAR CASE ..... 13*
*3.1.2 INSTALLATION OF THE GEAR CASE INTO THE ELECTRICAL PANEL ..... 13*
*3.1.3 CONNECTIONS TO THE POWER SUPPLY ..... 14*
3.1.3.1 Electrical Connections to the dosage systems (Users) ..... 14
3.1.3.1.1 Connection terminal box for wall device 4037/P ..... 15
3.1.3.1.2 Connection terminal box for panel device ..... 16
3.1.3.2 Connections to the Power Supply ..... 17
*3.1.4 PROBE CONNECTION pH/Rx ..... 17*

**4 METHODS OF USE ..... 18**

4.1 COMPOSITION OF THE MEASURING SYSTEM ..... 18
*4.1.1 MINIMUM CONFIGURATION ..... 18*
*4.1.2 MAXIMUM CONFIGURATION ..... 18*
4.2 IGNITION OF THE SYSTEM ..... 19
*4.2.1 MENU FUNCTIONS AT IGNITION ..... 19*
4.2.1.1 Type of measurement selection (configuration pH or Redox ) ..... 19
4.2.1.2 Temperature adjustment ..... 19
4.2.1.3 Contrast adjustment ..... 20
4.3 INTRODUCTION OF OPERATIVE PARAMETERS – THE USE OF KEYS ..... 20
*4.3.1 SETTINGS MENU (RELAY OUTPUT - SET POINT 1) ..... 21*
*4.3.2 SETTINGS MENU (RELAY OUTPUT - SET POINT 2 ETC.) ..... 24*
*4.3.3 SETUP MENU (TEMPERATURE – SYSTEM SETUP - PID SETUP) ..... 26*
*4.3.4 SETUP MENU (DIGITAL INPUT) ..... 29*
*4.3.5 CALIBRATION MENU ..... 30*
*4.3.6 ANALOGUE OUTPUT MENU ..... 34*

*4.3.7 ARCHIVE MENU ..... 35*
*4.3.8 MENU OF MEASURING GRAPHICS ..... 36*
*4.3.9 MENU MANUAL CONTROL ..... 37*
*4.3.10 MENU "EXIT MENU" ..... 38*
*4.3.11 FUNCTIONS IN RUN ..... 38*
**5 USER MAINTENANCE ..... 40**
5.1 SPECIAL CAUTIONS FOR CRITICAL COMPONENTS ..... 40
**6 CORRECTIVE MAINTENANCE ..... 41**
6.1 REPLACEMENT OF FUSES ..... 41
**7 LIST OF SPARE PARTS FOR REPLACEMENT ..... 42**

# 1 GENERAL

## 1.1 INFORMATION ON THE MANUAL

This document contains reserved information. It may be subject to modifications and updates without any prior notice.

This manual is an integral part of the instrument. Upon initial installation of the equipment, the operator must carry out a careful control of the contents of the manual in order to check its integrity and completeness.

If for any reason it is ruined, incomplete or inadequate please contact the factory in order to reintegrate or replace the non-compliant manual immediately.

For countries of different languages from the ones indicated above, the official manual will remain the one in Italian.

Compliance with the operative procedures and the precautions described in this manual is an essential requirement for the correct operation of the instrument and to guarantee total operator safety.

The manual must be ready in all parts, in front of the instrument, before use so that all methods of operation are clear as well as the controls, connections to the peripheral equipment and precautions for a correct and safe use.

The user manual must be stored, integral and legible in all parts, in a safe place and at the same time it must be immediately accessible to the operator during installation, use and/or installation revision operations.

### 1.1.1 CONVENTIONS

The present user manual uses the following conventions:

**NOTE**

**The notes contain important information to be highlighted compared with the rest of the text. They generally contain information that is useful to the operator to carry out and optimise operative procedures of the equipment in a correct manner.**

**CAUTION**

**Caution messages appear in the manual before procedures or operations that must be observed in order to avoid any possible losses of data or damages to the equipment.**

**CAUTION**

**Caution messages appear in the manual in correspondence to the description of procedures or operations that, if carried out incorrectly, may cause damages to the operator or users.**

## 1.2 DECLARATION OF RESPONSIBILITY BY THE MANUFACTURER

The factory will be held responsible for the safety, reliability and performance of the equipment only if used in compliance with the following conditions:

- Calibration, modifications or repairs must be carried out by qualified personnel
- Opening of the equipment and access to its internal parts may only be carried out by personnel qualified for maintenance
- The environment in which the equipment is used must comply with safety regulations.
- The electrical connections of the environment must be carried out according to regulations and must be perfectly efficient.
- Replacements that can be carried out on parts of the equipment and accessories must be done so with others of the same kind and of the same characteristics.
- The use and maintenance of the equipment and of relative accessories must be carried out in compliance with the instructions indicated in this manual.
- This manual must always be kept integral and legible in all parts.

## 1.3 LIMITS OF USE AND PRECAUTIONS FOR SAFETY

In order to guarantee safety of the operator together with the correct functioning of the equipment, it is important to work within the limits permitted and to adopt all of the precautions listed below:

**CAUTION**

**Check before use to make sure that all safety requirements are fully satisfied. The equipment must not be powered or connected to other equipment until safety conditions are satisfied.**

### 1.3.1 ELECTRICAL SAFETY

**CAUTION**

**All of the connections on the gear case are isolated from the environment ground (mass is not isolated).**
**DO NOT connect any of these connections to earth.**

In order to guarantee conditions of utmost safety for the operator, we recommend that all of the indications listed in this manual are respected.

- **Power the equipment exclusively using network tension according to specifications (85÷265VAC 50/60Hz)**
- **Replace damaged parts immediately.** Cables, connectors, accessories or other parts of the equipment that may be damaged or not working correctly must be replaced immediately. In this case contact your nearest authorised technical assistance centre.
- **Only use accessories and peripheries specified.** In order to guarantee all of the safety requirements, it is important to make exclusive use of the accessories specified in this manual which have been tested in combination with the equipment. The use of accessories and consumption materials of other manufacturers or not specifically recommended by the factory will not guarantee the safety and correct operation of the equipment. Only use peripherals that comply with the regulations of their specific categories.

### 1.3.2 SAFETY OF THE OPERATIVE ENVIRONMENT

- **The panel of the 4037/P gear case is protected against the introduction of liquids.** Avoid subject the equipment to the risk of dripping water, sprays of water or immersion in water and the use in environments in which such risks may be present. Equipment in which liquids may have accidentally penetrated must be immediately switched off, cleaned and controlled by authorised and qualified personnel.
- Once programming has been carried out, we recommend that the transparent panel is closed.
- **Protection.**
  - with a closed transparent panel IP65 EN60529
  - with an open transparent panel IP54
  - EMI /RFI CEI EN55011 - 05/99
- **Use the equipment within the environmental limits of temperature, humidity and pressure specified.** The instrument has been developed to operate in the following environmental conditions:
  - Temperature of the working environment 0°C ÷ +50°C
  - Temperature of storage and transportation -25°C ÷ +65°C
  - Relative humidity 10% ÷ 95%RH – not condensing

**CAUTION**

**The water treatment plant in which the instrument is introduced must be developed in accordance with the functional requirements imposed by current legislation.**

**The apparatus must be inserted perfectly into the plant.**

**The plant must be kept operative in full compliance with the safety regulations provided.**

**The parameters indicated on the control gear case of the analyser must comply with current regulations.**

**Any signals of faults to the device must be positioned in an environment that is constantly controlled by operative personnel or plant assistants.**

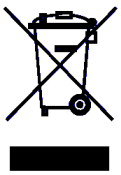
**Non compliance with even just one of these conditions may lead the "logics" of the device to operate in a potentially dangerous manner for users of the service.**

**Therefore, we recommend that service personnel and/or maintenance personnel operate with the utmost care, pointing out any changes to the safety parameters immediately, in order to avoid the creation of any potentially dangerous situations.**

**As the considerations indicated above cannot be controlled by the product in question, the manufacturer will not be held responsible for any damages that these malfunctions may cause to people or things.**

## 1.4 GRAPHIC SYMBOLS

The following table illustrates the drawings, the relative description and the position of all graphic symbols present on the equipment panels and on any other equipment or external devices to which they may be connected.

| SYMBOL | DESCRIPTION | POSITION |
|---|---|---|
| | **Danger symbol** | A symbol located close to the clamps for connection to power. |
| F<br>N<br>⏚ | **Phase** | Symbols located close to the connections of the equipment to the electricity network |
| | **Neutral** | |
| | **Earth protection** | |
| | **Caution! Refer to the documentation attached** | A symbol located close to the points in which the user manual should be consulted for important information. (see paragraph CAUTION). |
| G<br>B RS485<br>A | **Positive** | Positive pole of the connector RS485 |
| | **Negative** | Negative pole of the connector RS485 |
| | **Clamp** | A symbol located close to the shield of the cable for RS485 |
| NTC | **NTC** | Temperature sensor connection |
| + -<br>mA 1 | **Analogical output n.1** | 0/4 ÷20mA separated galvanically |
| + -<br>mA 2 | **Analogical output n. 2** | 0/4 ÷20mA separated galvanically |
|  | **Symbol of separate collection of electrical and electronic equipment.** | Symbol placed on the top of the electronic box |

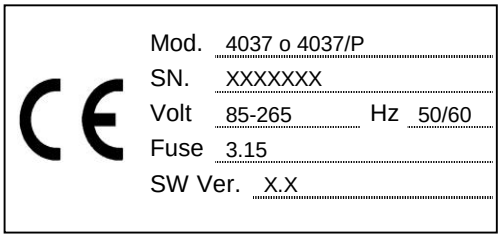
## 1.5 CAUTION SYMBOL

The symbol illustrated below represents the **CAUTION** symbol and reminds the operator that he should read the user manual for important information, advice and suggestions for the correct and safe use of the equipment.

In particular, when it is positioned close to connection points to cables and peripheries, the symbol in question refers to careful reading of the user manual for instructions related to the nature of such cables and peripheries and the methods for correct and safe connections.

For the position of the CAUTION symbols on the equipment, refer to Chapter 2 "*Commands and Indicators, Connections*" and Chapter 3 *"Installation"* of this user manual. The reproductions of equipment panels, with relative commands, connections, symbols and labels are provided in this chapter. Each caution symbol is accompanied by a detailed explanation of its meaning.

## 1.6 PLATE DETAILS




## 1.7 INFORMATION ON RECYCLING AND USE OF MATERIALS

The factory, in accordance with specific European regulations, aims at constant improvement of development and of production procedures of its equipment with the objective of drastically reducing the negative impact on the environment caused by parts, components, consumption materials, packaging and the equipment itself at the end of its life cycle.

Packaging is conceived and produced to allow for its re-use or recovery, including recycling of the majority of the materials and to reduce the amount of waste or residues to be disposed of, to a very minimum. In order to assure a correct environmental impact the equipment has been designed with the smallest circuit possible, with the lowest differentiation possible of materials and components, with a selection of substances that guarantee utmost recycling and maximum reuse of the parts and waste disposal free from ecological risks.

The equipment is made in such a way as to guarantee the easy separation or dismantling of the materials containing contaminants compared with others, in particular during maintenance operations and the replacement of parts.

**CAUTION**

**The disposal/recycling of packaging, of consumption materials and of the equipment itself at the end of its life cycle must be carried out in accordance with the norms and regulations that are currently valid in the country in which the equipment is used.**

### 1.7.1 SPECIAL ATTENTION TO CRITICAL COMPONENTS

The instrument is fitted with an LCD liquid crystal display, which contains small amounts of toxic materials.

# 2 GENERAL DESCRIPTION

The analyser of this manual is made up of an electronic gear case plus a technical manual.

The gear case may be installed on an electrical board (4037) or to the wall (4037/P) at a maximum distance of 15 metres from the measuring Probe.

It is powered by the network (85÷265Vac-50/60Hz) by a Switching feeder.

This equipment has been designed to analyse OFF-LINE and pilot the dosage pumps for the treatment of water in different applications:

- Primary Water, Drinking Water and Swimming Pool Water
- Refluent Water
- Treatment and Discharge of Industrial Water
- Environmental controls

## 2.1 MEASURING PRINCIPLES

### 2.1.1 PH MEASURER

It is an instrument designed to measure the level of acidity of a liquid, that is to say the property of a substance to be sent into an ion solution of Hydrogen ($H^+$). The unit of measurement of this property is pH (abbreviation of potential Hidrogenium) and it represents the opposite of the decimal logarithm of the concentration of H+ ions present in the solution. In the case of pure water at room temperature, the value indicated above is 7. Basic solutions are the ones with a pH value above 7 and acid solutions are the ones with a pH level below 7. The highest and lowest limits of the scale are pH=0 for pure acids and pH=14 for pure bases.

Electrochemical, exam strips, indicators or colour metres are the pH value measurers available. Out of all of these methods, just one electrochemical measuring provides well defined results.

This measuring is carried out using electrodes for the pH.

The electrode for the pH is an electrochemical sensor made up of a measuring reference electrode. With regards to the pH value of the solution examined, the tension on a membrane varies.

The electrodes for the pH value currently in use have been developed to indicate a pH value of 7 in the presence of a tension of 0 mV in the membrane. The more the value moves from pH=7, the greater the tension of the signal. The pH metre determines the pH value according to this signal.

### 2.1.2 REDOX MEASURER

An instrument to measure the potential of the Oxidation Reduction Potential (ORP) that indicates the ability to exchange electrons between a donor element (reducing) and an accepting element (oxidizing) measured through the potential undertaken by an indifferent electrode (platinum/gold) emerged in the solution containing the oxidized or reduced form, compared with an oxidize chosen by chance as a zero electrode. The unit of measurement is Volts, but one of its multiples, milli-volts ($mV = V \times 10^{-3}$) is often used.

Some application examples of this measurement are the control of de-nitrification of discharge waters (the determination of the number of oxidization), surveillance of the disinfections effect of drinking water or swimming pool water or even for decontamination in galvanic procedures.

Measuring is carried out using an electrode for oxidation reduction. As in the case of the electrode for the pH value, this sensor is made up of a measuring electrode and a reference electrode. The measuring function however is not carried out, in this case, by a glass membrane but by a platinum

(or gold) membrane. The inclination of the ions in the solution to absorb or transmit electrons determines the potential of the platinum and consequently the tension of the electrode. Normal electrodes currently in use are fitted with a hydrogen electrode (UH), a silver/silver chloride electrode (UB) and this means that the tension indicated refers to this system.

## 2.2 MAIN CHARACTERISTICS

- Measuring of the pH level or Redox can be selected by the operator when the equipment is turned on from the key pad.
- Measuring of Temperature using the NTC / PT100 / PT1000 Probe
- Automatic Compensation of Temperature
- Programming key pad with 4 keys
- LCD Graphic display 128x64 with background illumination
- Internal Data Logger (flash 4 Mbit) with the possibility of graphic and table visualisation of measurement trends
- PID adjustment
- Serial output RS485 MOD BUS RTU
- 2 Programmable Analogical Outputs
- 1 Relay Output for Instrument Anomaly Alarm
- 2 Relay Outputs for intervention thresholds
- 1 Relay Output for Probe Washing
- 1 Digital Entrance for disabling of doses

- ***Main hardware characteristics of the device***

  The hardware structure of this periphery is based on the adoption of extremely new CPU CMOS with 8 bits developed specifically for the execution of the so-called "embedded" applications.

  The card uses an EEPROM to store the Set-up data and flash memories for storage of the archives of historical data and LOG files of events.

  The Card has 1 RS485 gate (opto-isolated) for local networks used for connections with local communication devices (configuration computer, terminals and remote controls etc).

  The card integrates a Real Time Clock (clock with date) that allows the software to storage figures in a chronological order.

- ***The device has been designed to be fitted onto a panel, and is built with an IP65 protection panel.***

### 2.2.1 TECHNICAL CHARACTERISTICS FOR PH MEASURING

The technical characteristics of the Analyser are listed in the following Table:

| | |
|---|---|
| **Measurement range** | 00.00 ÷ 14.00pH |
| **Resolution** | ± 0.01pH |
| **Precision** | ± 0.2% f.s. |

### 2.2.2 TECHNICAL CHARACTERISTICS FOR REDOX MEASURING

| | |
|---|---|
| **Measurement range** | ± 1500mV |
| **Resolution** | ± 1mV |
| **Precision** | ± 0.2% f.s. |

### 2.2.3 TECHNICAL CHARACTERISTICS FOR MEASURING OF SECONDARY TEMPERATURE

| | |
|---|---|
| **Sensor** | NTC 2250 Ohm a 25°C / PT100 / PT1000 |
| **Measurement range** | -10 ÷ +130°C. |
| **Resolution** | ± 1°C |
| **Precision** | ± 1% f.s. |

**Maximum load applicable**

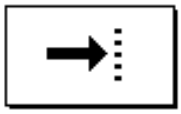
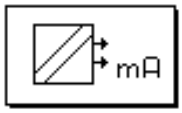
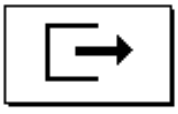
For every digital output a relay with contacts opened normally is used. The maximum current commutable is 1 Ampere, the maximum tension commutable is 230Vac, maximum power 230VA on a resistive load.

## GRAPHIC DISPLAY

The graphic display allows for visualization of the various programming menus and, in the measuring method (RUN), visualization of the measurements and of the state of operation.

### 2.2.4 LIST OF PRIMARY MENUS

The following table illustrates the symbols visualized on the display which represent the various programming menus.

| VISUALIZATIONS ON THE GRAPHIC DISPLAY | DESCRIPTION |
|---|---|
| 1 | SETTINGS MENU<br>All basic parameters for operation logics are set |
| 2   | CALIBRATIONS MENU<br>Calibration Procedure of the electrode |
| 3   | ANALOGUE OUTPUT MENU<br>Setting of analogical outputs in current |
| 4 | ARCHIVE MENU<br>Setting of the data archive and visualization mode |
| 5 | GRAPHICAL MEASUREMENT MENU<br>Visualization of archives in a graphical form |
| 6 | MANUAL CONTROL MENU<br>Manual control and activation of Entries and Outputs |
| 7   | Return to operation in measuring method (RUN) |

### 2.2.5 DIVISION OF THE GRAPHICAL DISPLAY INTO AREAS IN THE RUN METHOD

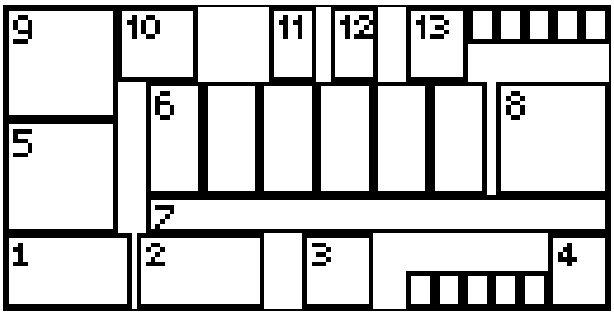
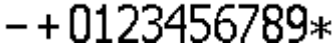
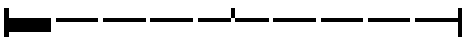
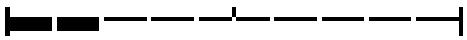
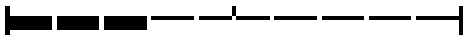
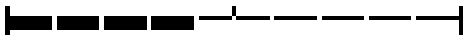



**Figure 1 – Graphic display - divided up into areas**

In the following table, for every area of the display indicated in figure 3, the symbols that may appear during functioning of the gear case in a measurement method (RUN) are represented and briefly described.

| GRAPHICAL AREA | REPRESENTATION | DESCRIPTION |
|---|---|---|
| 1 | | Set1 - Open Relay |
| | | Set1 - Closed Relay |
| | | Set1 – Timed<br>Active Threshold Relay Open |
| | | Set1 – Timed<br>Deactivated Threshold Relay Open |
| | | Set1 - Timed<br>Active Threshold Relay Closet |
| 2 | | Set2 - Open Relay |
| | | Set2 - Closed Relay |
| | | Set2 - Timed<br>Active Threshold Relay Open |
| | | Set2 - Timed<br>Deactivated Threshold Relay Open |
| | | Set2 – Timed<br>Active Threshold Relay Closed |
| 1-2 | | Disabling Set<br>Indicates digital entrance ON |

| GRAPHICAL AREA | REPRESENTATION | DESCRIPTION |
|---|---|---|
| | | Stay time<br>Probe frozen on a value |
| | | Maximum Logical Set Exceeded |
| | | Minimum Logical Set Exceeded |
| | | Maximum dosage time exceeded |
| 3 | | Washing stage active |
| 4 | | Value output n.1 (in mA) |
| | | Value output n.2 of temperature (in mA) |
| | | Value output n.2 auxiliary (in mA) |
| | | Value output n.2 with PID function PID (in mA) |
| | | Real temperature value (in Fahrenheit) |
| | | Manual value of temperature (in Fahrenheit) |
| | | Real temperature value (in Centigrades) |
| | | Manual temperature value (in Centigrades) |
| 5 | | Alarm active – Alarm relay closed |
| 6 |  | Numerical |
| 7 | | 0% of the scale |
| |  | 10% of the scale |

| GRAPHICAL AREA | REPRESENTATION | DESCRIPTION |
|---|---|---|
| |  | 20% of the scale |
| |  | 30% of the scale |
| |  | 40% of the scale |
| | | 50% of the scale |
| | | 60% of the scale |
| | | 70% of the scale |
| | | 80% of the scale |
| | | 90% of the scale |
| | | 100% of the scale |
| 8 | | pH-meter measurement unit |
| | | Rx-meter measurement unit |
| | | Seconds during stabilization |
| 9 | | Archive full |
| | | Storage of Data |
| 10 | | Frozen probe |
| 11 | | Wait – Freezing stage of measurements and outputs |
| 12 | | Active Password |
| 13 | | System Clock |

# 3 INSTALLATION

Before installing the **µACP 4037 or µACP 4037/P** carefully read the instructions provided below.

## 3.1 COMPOSITION OF THE SUPPLY

The supply consists of just one package which contains the following parts:

- 1 electrical control and command panel PN .....?????
- 1 Technical Manual PN .....?????
- 2 fixing brackets - one for panel gear case **µACP 4037** .

### 3.1.1 INSTALLATION OF WALL MOUNTED GEAR CASE

The wall must be completely smooth in order to allow for perfect adhesion of the gear case.

| Mechanical Dimensions | µACP 4037/P pH-Rx |
|---|---|
| Dimensions (L x H x P) | 195x160x140mm |
| Fixing depth | 140mm |

The terminal box for connections is located on the bottom of the gear case and it is necessary to keep it separated from other equipment by at least 15 cm. in order to make it easier to use. Keep away from water drips and/or sprays of water from adjacent areas in order to safeguard the instrument during programming or calibration stages.

### 3.1.2 INSTALLATION OF THE GEAR CASE INTO THE ELECTRICAL PANEL

The wall must be perfectly smooth in order to allow for perfect adhesion of the electrical panel close to the gear case.

The net depth of the panel must be at least 130 mm.

The thickness of the panel must not exceed 5 mm.

The perforation DIMA must comply with the following layout:

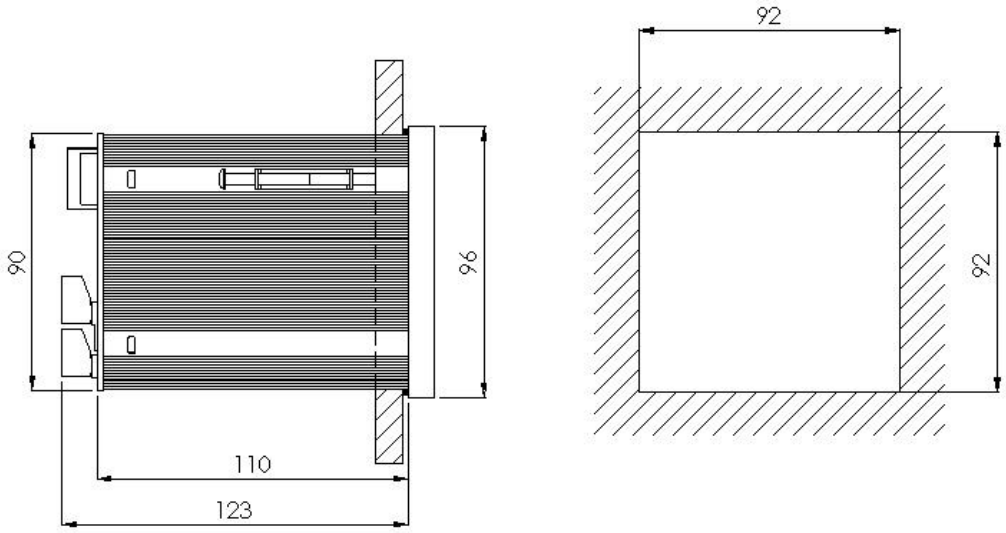


**Figure 2 – Encumbrance and Dima for perforation of the panel**

| Mechanical Dimensions | µACP 4037 pH-Rx |
|---|---|
| Dimensions (L x H x P) | 96x96x110mm |
| Fixing depth | 130mm |

Fixing of the Gear case to the panel is carried out using two brackets (1)included in the standard supply, which are inserted into the housings (2) and fixed into position using the relative screws (3).

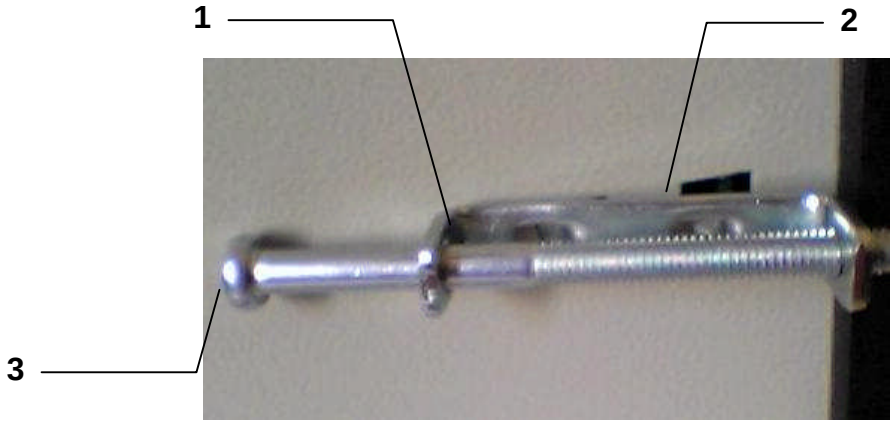



Figure 3 – Fixing bracket of the Gear case to the Panel

Keep free from dripping and/or sprays of water from adjacent areas.

### 3.1.3 CONNECTIONS TO THE POWER SUPPLY

If possible avoid any cables destined for high power use to be positioned close to the gear case as they may cause faults of an inductive nature to the analogical section of the instrument.

Apply a tension alternating between 85Vac and 265Vac 50/60 Hz or, according to details on the identification plate, the most stabilised tension possible.

Avoid at all costs connections to power supplies that have been rebuilt, for example, with the help of transformers in which this rebuilt power supply will feed other systems beyond the gear case (perhaps of an inductive kind) because, in this way, high tension spikes will be created and once they are irradiated it becomes very difficult to block and/or eliminate them.

**CAUTION**

**The electric line must be fitted with a suitable life-saving device and magneto-thermal, in compliance with correct installation norms.**

In any case it is always best to check the quality of the Ground connection. It is very common to find Ground connections, mainly in industrial environments, that are generators themselves of disturbances: in the case of any doubts on quality a connection to a rod dedicated to the gear case plant is recommended.

#### 3.1.3.1 Electrical Connections to the dosage systems (Users)

**CAUTION**

**Before starting connections between the Gear Case and the external Users, make sure that the electrical panel is switched off and the cables from the Users are not under tension.**

"Users" mean the outputs and relays used in the gear case

- (SET1) for the Dosage Pump or control command
- (SET2) for the Dosage Pump or control command
- (ALARM) the alarm command transmitted by the instrument to the siren and/or flashing light
- (WASH) electrode washing command

**CAUTION**

**Each relay contact can support, on a resistive load, a maximum current of 1 Ampere with a max. of 230V, therefore a total power of 230VA**

If the load to be handed is of low power or of a resistive nature, the layout indicated in Fig. 7-a) can be used.

In the case of higher levels of power it is best to carry out connections as indicated in the layout of fig. 7-b)

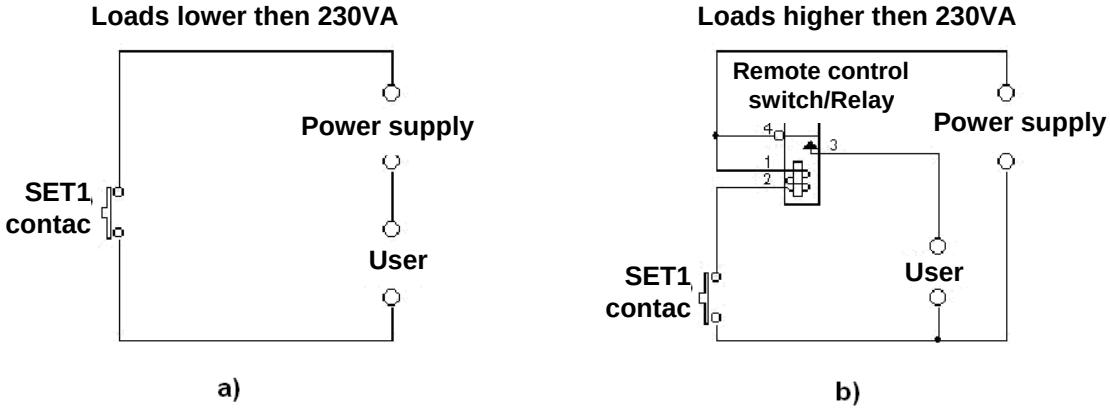



**Figure 4 Examples of connection with users**

**NOTE**

**The layouts indicated above are typically indicative as details of all of the protection and safety devices necessary are missing.**

### *3.1.3.1.1 Connection terminal box for wall device 4037/P*

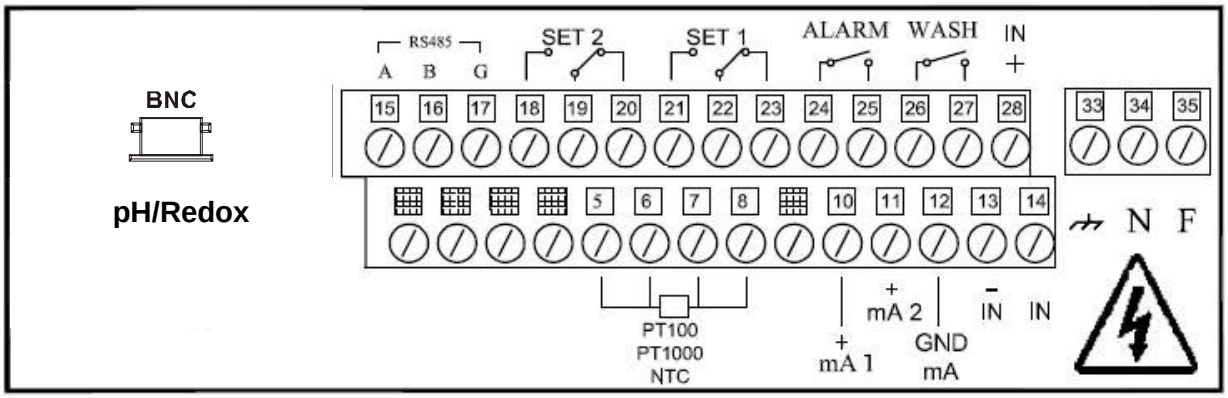



**Figure 5 Connections for wall model**

| N° CLAMP | GRAPHIC | DESCRIPTION |
|---|---|---|
| 5 | PT100 PT1000 NTC | NTC / PT100 / PT1000 Common Cable |
| 6 | | NTC / PT100 / PT1000 Signal Cable |
| 7 | | NTC / PT100 / PT1000 Signal Cable |
| 8 | | NTC / PT100 / PT1000 Common Cable |
| 10 | + mA 1 | mA1 positive cable |
| 11 | + mA 2 | mA2 positive cable |
| 12 | GND mA | GND mA output |
| 13 | - IN | Negative input 24Vdc (flux sensor) |
| 14 | IN | Digital input 24Vdc (flux sensor) |
| 15 | RS485 A B G | Interface RS485 (A) |
| 16 | | Interface RS485 (B) |
| 17 | | Interface RS485 (G) |
| 18 | SET 2 | Relay for Set Point 2 (contact N.O.) |
| 19 | | Relay for Set Point 2 (contact C.) |
| 20 | | Relay for Set Point 2 (contact N.C.) |
| 21 | SET 1 | Relay for Set Point 1 (contact N.O.) |
| 22 | | Relay for Set Point 1 (contact C.) |
| 23 | | Relay for Set Point 1 (contact N.C.) |
| 24 | ALARM | Relay for remote alarm |
| 25 | | Relay for remote alarm (contact N.O.) |
| 26 | WASH | Relay for washing of probe |
| 27 | | Relay for washing of probe (contact N.O.) |
| 28 | + IN | Positive input 24Vdc (flux sensor) |
| 31 | pH/Rx | Connection of pH or Rx probe, respect the clamp for the gear box and earth |
| 32 | | |
| 33 | | Power supply (Earth) |
| 34 | N | Power supply (Neutral) |
| 35 | F | Power supply (Phase) |

### *3.1.3.1.2 Connection terminal box for panel device*

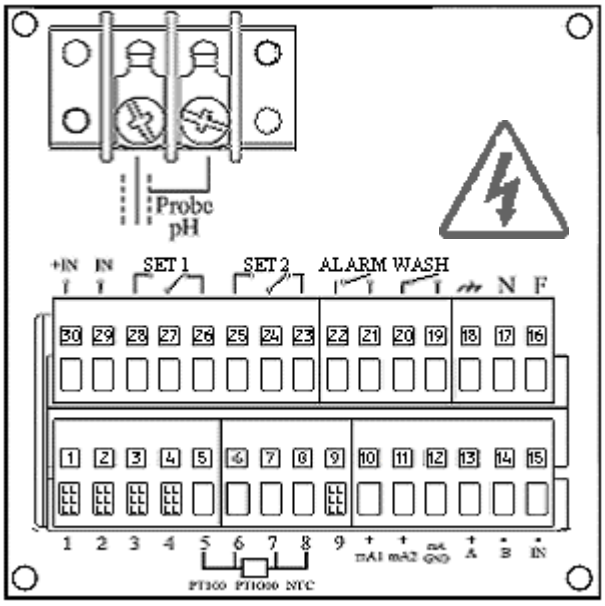
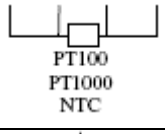
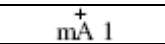
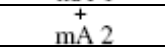
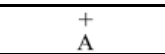
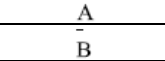
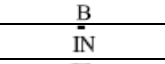
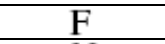
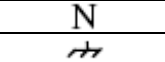
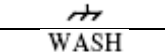
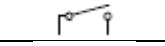
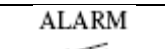
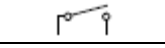
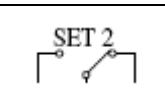
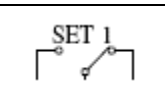
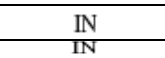
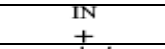
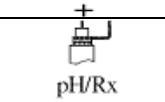



**Figure 6 Connections for the panel model (rear view)**

| N° MORSETTO | GRAFICA | DESCRIZIONE |
|---|---|---|
| 5 |  | NTC / PT100 / PT1000 Common Cable |
| 6 | | NTC / PT100 / PT1000 Signal Cable |
| 7 | | NTC / PT100 / PT1000 Signal Cable |
| 8 | | NTC / PT100 / PT1000 Common Cable |
| 10 |  | mA1 positive cable |
| 11 |  | mA2 positive cable |
| 12 |  | GND mA output |
| 13 |  | Interface RS485 (A) |
| 14 |  | Interface RS485 (B) |
| 15 |  | Negative input 24Vdc (flux sensor) |
| 16 |  | Power supply (Phase) |
| 17 |  | Power supply (Neutral) |
| 18 |  | Power supply (Earth) |
| 19 |  | Relay for washing of probe (contact N.O.) |
| 20 |  | Relay for washing of probe |
| 21 |  | Relay for remote alarm (contact N.O.) |
| 22 |  | Relay for remote alarm |
| 23 |  | Relay for Set Point 2 (contact N.C.) |
| 24 | | Relay for Set Point 2 (contact C.) |
| 25 | | Relay for Set Point 2 (contact N.O.) |
| 26 |  | Relay for Set Point 1 (contact N.C.) |
| 27 | | Relay for Set Point 1 (contact C.) |
| 28 | | Relay for Set Point 1 (contact N.O.) |
| 29 |  | Digital input 24Vdc (flux sensor) |
| 30 |  | Positive input 24Vdc (flux sensor) |
| Terminal box |  | Connection of pH or Rx probe, respect the clamp for the gear box and earth |

### 3.1.3.2 Connections to the Power Supply

Once you have made sure that the tension complies with the one indicated in the previous paragraphs, connect the electrical power line to the clamps marked by connecting the clamp with the relative symbol to earth.

## 3.1.4 PROBE CONNECTION pH/Rx

Switch the instrument off.

Connect the electrode cables to the meter terminal board according to the colour codes on the adhesive label placed under the electronics container cover or referring to the manual (see par. 3.1.3.1.1 and 3.1.3.1.2).

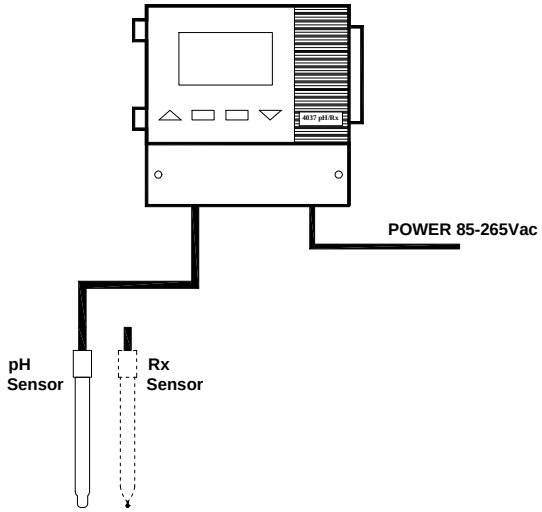
The Oxygen electrode cable max. length should not be longer than 15 metres. It is a good practice not placing the cable near high-power or inverter's cables, thus avoiding any interference when measuring the Oxygen values.

# 4 METHODS OF USE

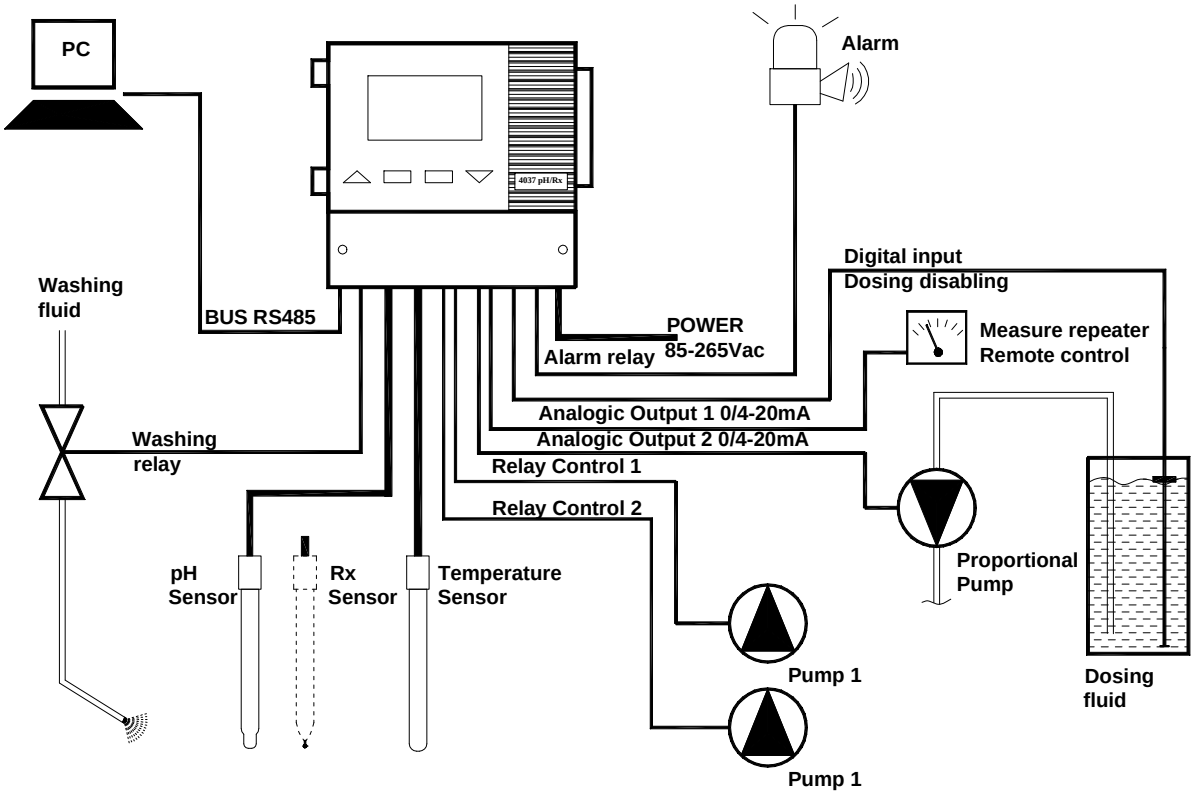
## 4.1 COMPOSITION OF THE MEASURING SYSTEM

### 4.1.1 MINIMUM CONFIGURATION

**Configurazione Minima**




### 4.1.2 MAXIMUM CONFIGURATION



## 4.2 IGNITION OF THE SYSTEM

Once the electronic device and the measuring probe (pH or Rx) have been connected, programming of the software must be carried out in order to determine “personalisation” of parameters for correct use of the equipment.

Turn on the equipment by connecting it to the mains, the device does not have a power supply switch.

### 4.2.1 MENU FUNCTIONS AT IGNITION

When the equipment is turned on, it is possible to use some keys to intervene on programming functions not present in the SETUP.

(See paragraphs 4.2.1.1; 4.2.1.2; 4.2.1.3)

#### 4.2.1.1 Type of measurement selection (configuration pH or Redox )

Press the **UP** and **DOWN** keys together before turning the equipment on, then turn on and keep them pressed down for at least 5 seconds.

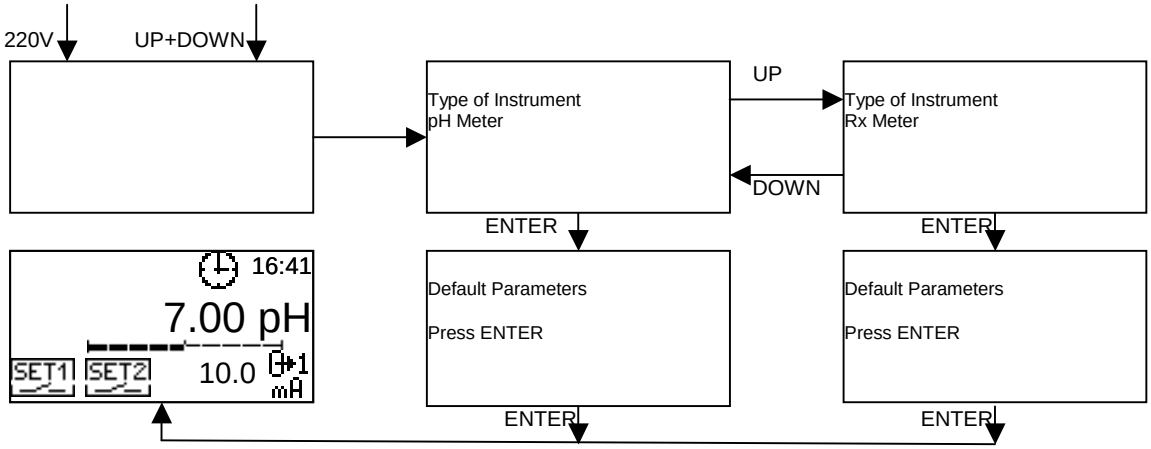



**Figure 7 – Flow-Chart of Instrument Editing Function**

#### 4.2.1.2 Temperature adjustment

Following the same procedure, but only keeping the **UP** button pressed, it is possible to regulate the temperature OFF SET.

The sequence is illustrated in fig. 11.

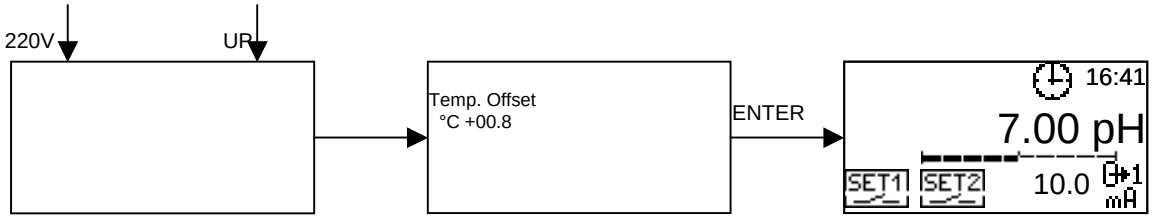



**Figure 8 – Flow-Chart of the temperature Offset function**

The temperature variation is achieved using the **UP** and **DOWN** keys, with 0.1°C steps.

#### 4.2.1.3 Contrast adjustment

Using the same procedure, but keeping the **DOWN** button pressed, the display contrast adjustment window will appear.

**NOTE**

**During this operation release the DOWN button immediately after the first acoustic beep, otherwise the contrast will go quickly to 0% and the display will be completely white. In order to reset the correct level, simply press the UP key to the desired value.**

Using the **UP** and **DOWN** keys it is possible to adjust the contrast percentage.

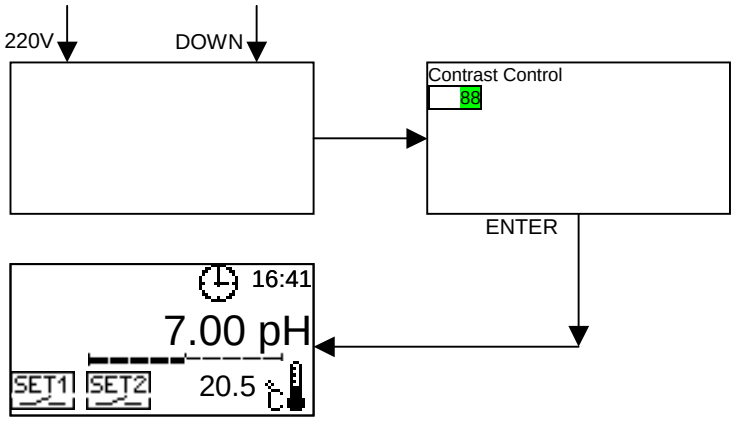



**Figure 9 – Flow-Chart Contrast Function**

Subsequently pressing ENTER, the RUN visualisation will be activated.

## 4.3 INTRODUCTION OF OPERATIVE PARAMETERS – THE USE OF KEYS

In order to introduce/modify operative figures and to carry out calibration procedures, use the menus visualised on the display through the 4 function keys located on the front panel of the gear case.

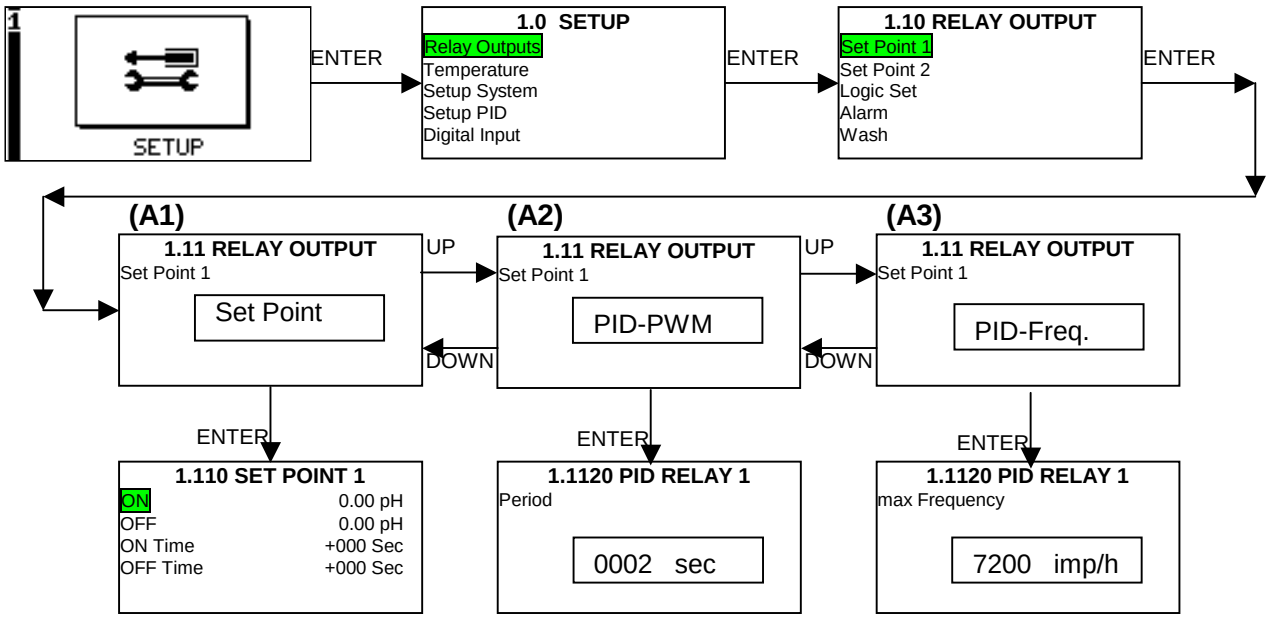
When turned on the apparatus will automatically position itself in a measuring method – the RUN function. By pressing the ESC key the programming method will be available through the first menu " 1 SETTINGS".

Using the UP and DOWN keys the various menus and submenus can be scrolled and information can be modified (increase/reduction).

Using the ENTER key access will be provided to the submenus for the input of information and the variations made will be confirmed.

By pressing the ESC key the screen will go back to the menu or to the previous function and any variations made will be cancelled.

### 4.3.1 SETTINGS MENU (RELAY OUTPUT - SET POINT 1)




The programming parameters of Set Point 1 establish the working logic of Relay 1. It is possible to programme using the logics of Relay 1 in the following ways:

**A1) Threshold**

By programming the Set Point for this function, we can activate the relay as a Threshold by programming an ***ON*** value (relay activation) and an ***OFF*** value (relay deactivation). The free programming of these two values will allow for the creation of a hysteresis suitable for any kind of application.

By programming the ***ON*** value higher than the ***OFF*** one (fig. 13.a) an *UPWARD* threshold will be achieved: (When the value exceeds the ***ON*** value, the relay is activated and remains active until the value falls below the ***OFF*** value).

By programming the ***OFF*** value higher than the ***ON*** one (fig. 13.b) a *DOWNWARD* threshold will be achieved: (When the value falls below the ***ON*** value, the relay is activated and remains active until the value exceeds the ***OFF*** value). See fig.13.

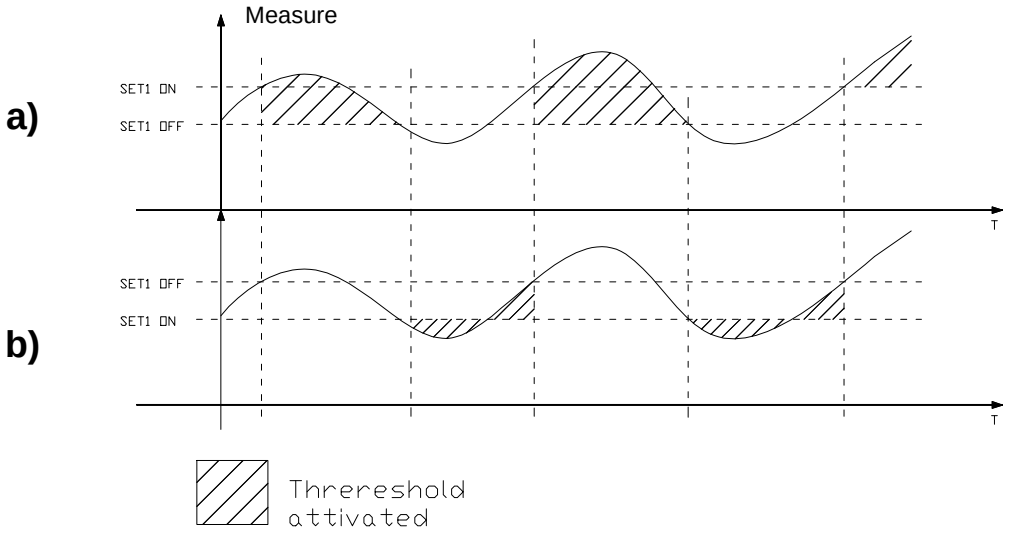



**Figure 10 – Threshold operation**

Furthermore by acting on the ***Time ON*** and ***Time OFF*** parameters it is possible to define a *DELAY* time or a *TIMED* operation of the Relay during its activation.

Negative of positive ON and OFF Times can be defined. (fig. 14)

By programming *Negative Times* the *DELAY* function is activated:

*Eg. Time ON: –5sec , Time OFF -10sec.* (fig. 14.a)

When the threshold is activated, the relay will close after 5 seconds (***ON time***) and it will remain closet for the entire period in which the threshold is active. When the threshold is deactivated the relay will remain closed for another 10 seconds (***OFF time***) after which time it will open.

By programming *Positive Times* the *TIME* function will be activated:

*Eg. Time ON: 5sec , Time OFF 10sec.* (fig. 14.b)

When the threshold is activated the relay will alternate between an open/closed position according to the times programmed. In the case of the example the relay will close for 5 seconds (***ON time***) after which time it will remain open for 10sec (***OFF time***). This cycle will continue until Threshold 1 is not deactivated.

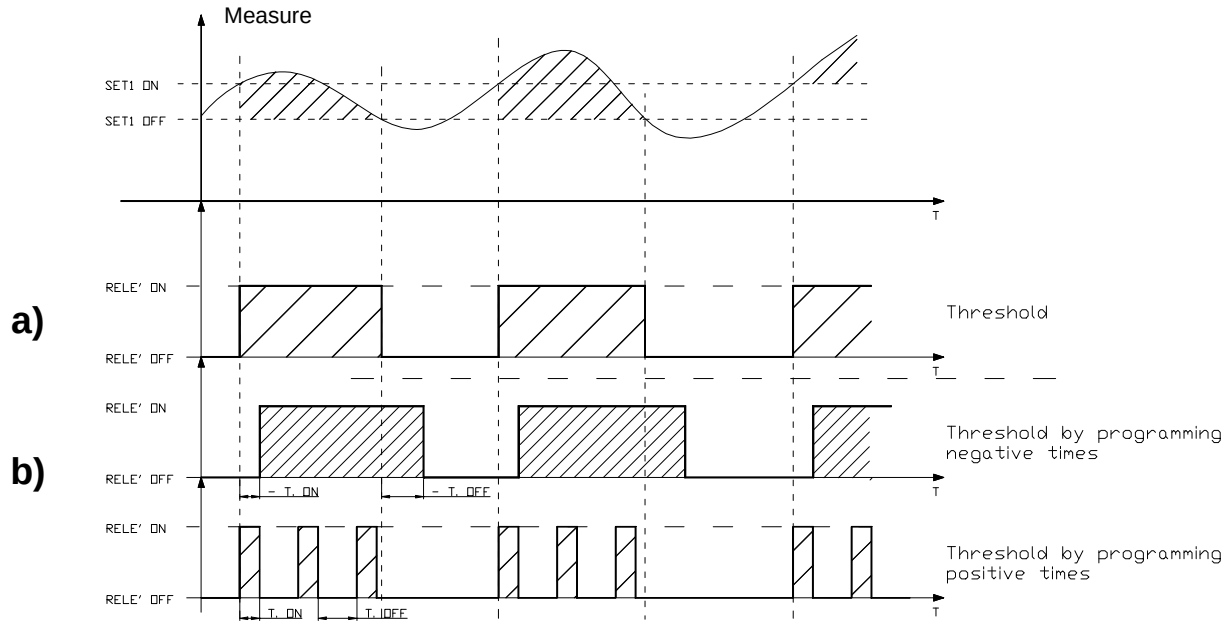



**Figure 11 – Operation of Relay 1**

### A2) PID-PWM

By defining the Set Point as PID-PWM, through Relay 1, it is possible to activate a pump with an ON/OFF command almost as if it had a proportional adjustment. For this function the time period must be programmed (in seconds) within which the calculation of the PWM adjustment will come about. The maximum time that can be programmed is 999 seconds with a 1 second step. We recommend starting with short periods of time and increasing them gradually in order to avoid drastic variations in measuring. For operation of the Relay in a PID-PWM function see fig. 15.b.

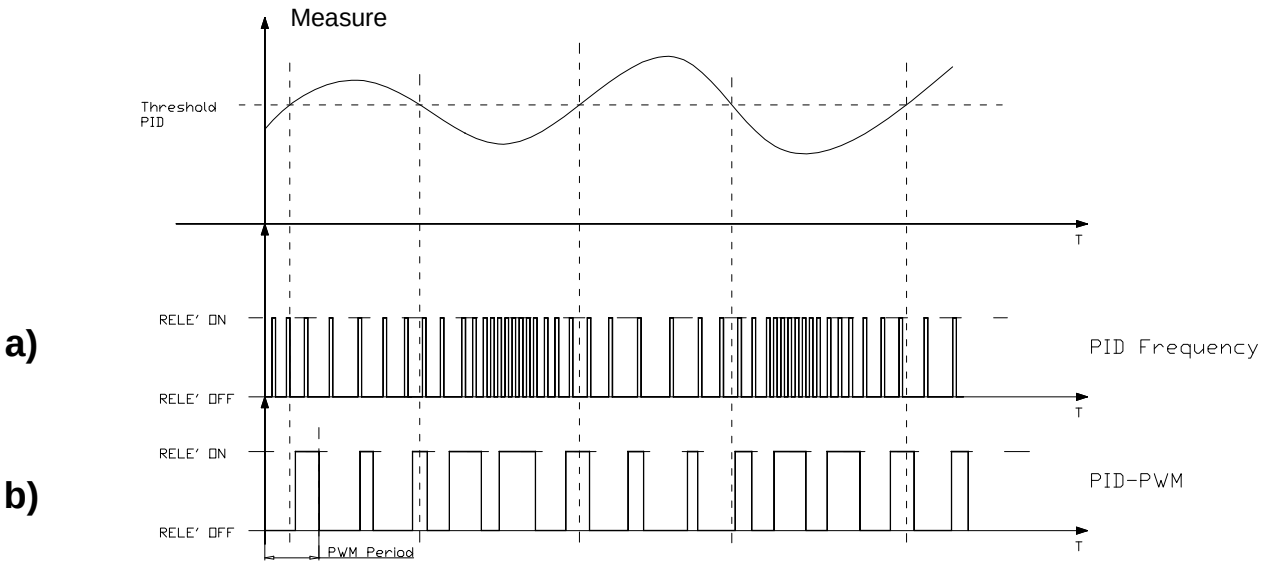



**Figure 12 – Operation of Relay 1 as PID**

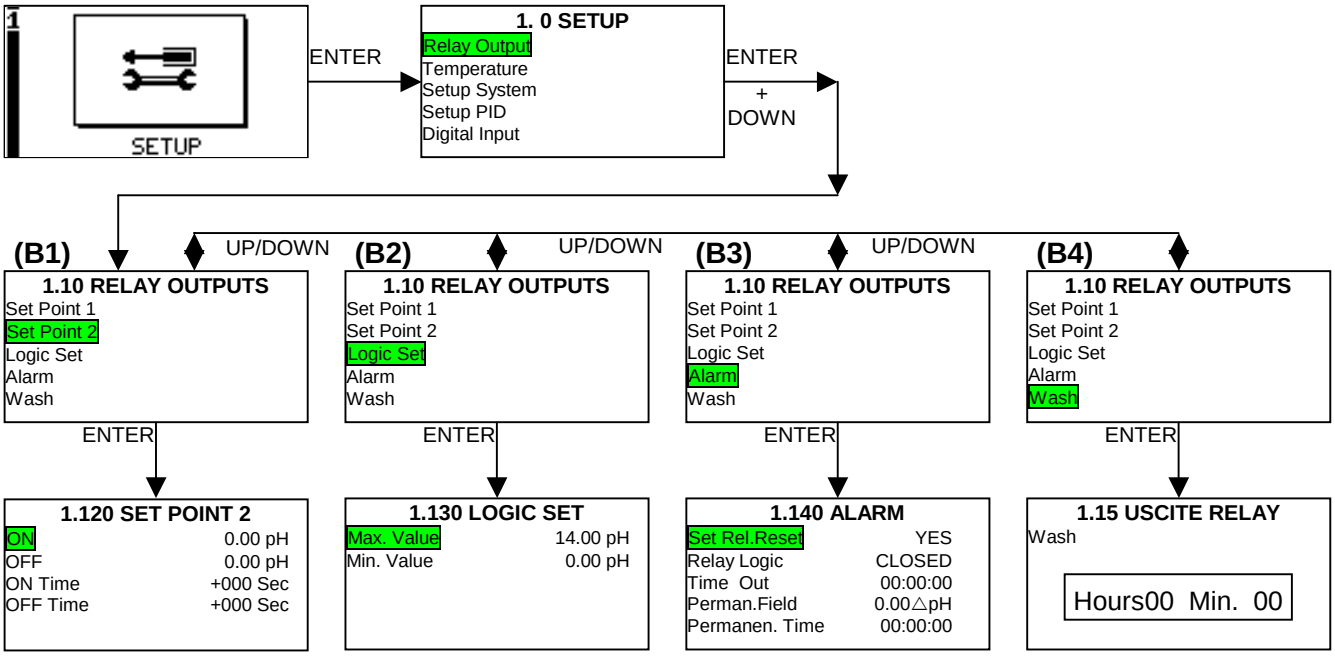
### A3) PID-Frequency

By setting the Set Point as PID-Frequency it is possible, through Relay 1, to control a pump directly with impulse inputs. The maximum number is 7200 imp/h with steps of 200. The ON and OFF impulse time is fixed at 250mSec. For operation of the Relay in a PID-Frequency see fig. 15.a.

**NOTE**

**Functions A2) and A3) are related to the programming of the PID parameters to be found in the menu 1.4 (Par.4.3.3). Therefore, before programming this function we recommend that you check the programming of the PID parameters.**

## 4.3.2 SETTINGS MENU (RELAY OUTPUT - SET POINT 2 ETC.)




**B1) Set Point2**

The programming parameters of Set Point 2 determine the functioning logic of Relay 2.

This Relay may only be programmed as a Threshold. Programming of threshold 2 is identical to the one described for Threshold 1.

**B2) Logical Set**

The parameters of the Logical Set determine the functioning of the Alarm Relay. This function is deactivated by default.

This function activates an alarm when the measuring values are located outside of a specific "window". It is, in reality, possible to programme a minimum value and a maximum value and once they are exceeded the instrument will generate an alarm. This function will allow an alarm to be activated if the measure values are over a certain "range". In fact, it is possible to program a minimum and a maximum value: when exceeded, the equipment will generate an alarm.

This Logical Set is useful to control any possible faults to the system, eg. Defects in the dosage pumps etc.

**B3) Alarm**

With this function the basic settings of the Alarm Relay are defined, all of which are handled by the anomaly conditions inside and outside of the instrument.

Considering the importance of this Relay, we recommend that it is connected to a visual and acoustic signal which should always be kept under control by personnel in charge of running the plant, in order to intervene immediately in the case of a signal.

Programming of the Alarm Relay is articulated into 5 functions, therefore allowing for external anomalies (measuring electrode and dosage systems) as well as internal anomalies to be kept under control. Description of the functions:

**SET RELEASE**

With this function it is possible to deactivate or activate dosages in the case of an alarm.

By programming YES, when any kind of alarm is activated, the Relay 1 and 2 contacts will open up immediately and the analogical outputs 1 and 2 will be cancelled.

By programming NO, even in the case of activation of the alarm, the Relay contacts and the analogical outputs will not change their position.

YES is set as a default.

**RELAY LOGICS**

The Alarm relay is an ON/OFF alarm and with this function it is possible to programme its opening/closing logic. CLOSED is set as a default.

By setting "CLOSED", the Alarm relay will be opened in normal working conditions and will close in the event of an alarm.

By setting "OPEN" it will work in exactly the opposite way. The Alarm relay will close in normal working conditions and will open in the event of an alarm.

Furthermore, by setting OPEN it is also possible to control the anomaly of the absence of power tension which will lead to the immediate opening of the relay.

**TIME OUT**

With this function it is possible to set a maximum activation time of Set Point 1 and 2 *after which time the alarm will be activated.* This allows for the state of the dosage pumps to be kept under control.

By default this function is deactivated (time 00:00.00). The maximum time that can be programmed is 60 minutes, at steps of 15 seconds.

**PERMANENCE FIELD – PERMANENCE TIME**

This function allows for the state of functioning of the measuring probe to be kept under control.

If the measurement is stabilised within a certain interval for a period of time that exceeds the time set, the instrument will generate an alarm.

In order to activate this function, the following must be set:

in the "PERMANENCE FIELD" step the minimum oscillation interval of measuring (delta pH or Rx)

in the "PERMANENCE TIME" the maximum time in which excursion must come about.

If, during the period of time programmed, measuring is always within the interval programmed, the instrument will set off an alarm.

By default this function is deactivated as a delta 0 and a time of 00:00:00 has been programmed. The maximum time that can be programmed is 99 hours at steps of 15 minutes.

**B4) Washing**

The instrument is fitted with a Washing Relay that can control a solenoid valve for washing of the measuring electrode.

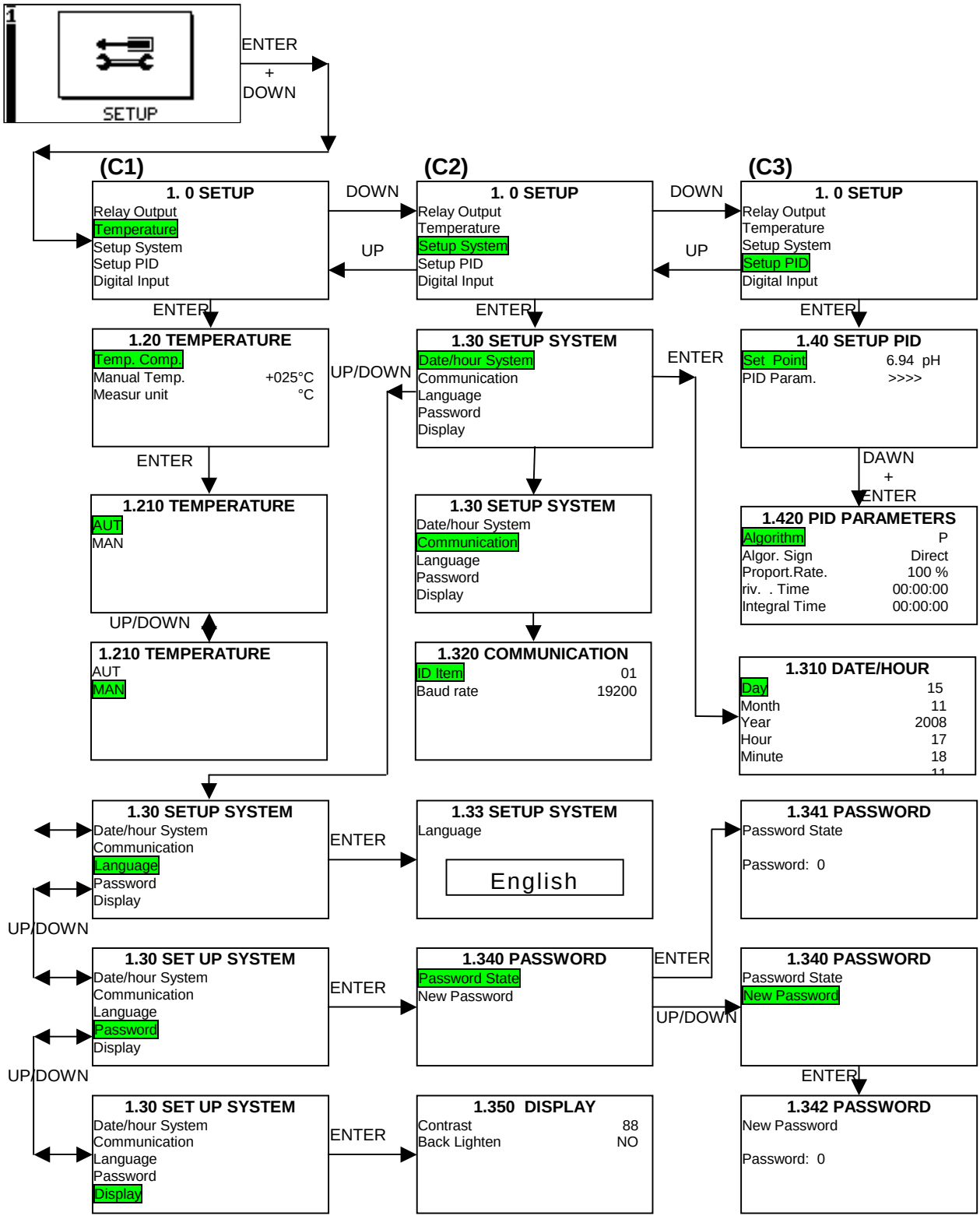
The washing stage lasts 1 minute altogether and it includes 15 seconds for control of the solenoid valve (closing of the washing relay) and 45 seconds for stabilisation of the probe.

With this function it is possible to set the interval of time between one washing stage and the next. Immediately before it starts, the instrument memorizes the values of the measurements, the state of Relay 1 and 2 and the values of the analogical outputs and it keeps them "frozen" for the entire duration of the washing cycle.

This situation is highlighted on the display using an hourglass and, furthermore, instead of the measuring value a counter appears indicating how many seconds are left until the washing stage is completed.

By default this function is deactivated as a time of 00 hours and 00 minutes is programmed. The maximum interval that can be programmed is 24 hours at steps of 15 minutes.

### 4.3.3 SETUP MENU (TEMPERATURE – SYSTEM SETUP - PID SETUP)



**C1) Temperature**

This function allows to automathic or manually set the temperature value and the temperature measuring unit.

By selecting “Temp. Comp.” and pressing ENTER is possible to choose the temperature setting: automathic (“AUT”) or manual (“MAN”); choosing “AUT” means that a temperature probe must be connected to reach the compensation. In this case, the display will show the real temperature value. If a compensated in temperature probe (S411) is not used, manually set the value of the measuring probe working temperature (conductivity). This allows the instrument to grant a correct compensation over the displayed measure.

The default set value is +25°C and can be changed by 1°C steps.

The Unit of Measurement function allows for the value of the temperature to be visualised in Centigrade or Fahrenheit. Centigrades are set as a default.

**C2) Setup System**

In this part of the programme which is divided up into 5 functions, the basic functioning parameters of the instrument are set.

Description of the functions:

**DATE/HOUR SYSTEM**

Setting of the DATE and TIME of the system that will be memorised every time that figures are viewed in a historical perspective.

**COMMUNICATION**

The instrument has a serial port in RS485 which is separated galvanically and can be used for dialogue with a HOST system using the standard protocol MOD BUS RTU. Through the serial port it is possible to visualise the real time status, programme all of the Set-Up and downloading all of the archives of the instrument.

The Communication Set-up function is used to programme the serial port and is divided up into two settings:

ID Instrument: A numerical address from 1 to 99 to which the instrument will reply. The default is 01.

Baud Rate: Speed of the RS485 serial which can be programmed at between 1200 and 38400. The default is 9600.

LANGUAGE

It is possible to select the language used by the Software between: Italian, English, French, Spanish and German.

PASSWORD

At this stage it is possible to activate and programme for access to the instrument. Once activated, each time that the programming stage is accessed the access password will be requested.

The password is made up of a 4 figure number. The default is 2002 which will always remain active even if a new password is programmed.

In order to access the step “Password Status” or “New Password”, the existing password must be inserted and then the new input can be carried out.

DISPLAY

Contrast: It allows for the definition of a greater or lower contrast of the display according to the temperature in which the instrument is operating.

Background illumination: At this stage you can decide whether or not to maintain background illumination or to switch it off one minute after having released the key. By programming YES the background illumination stays on, by programming ON it switches off automatically. NO is programmed as a default.

### C3) Setup PID

In this step of the programme, the programming of parameters for PID functioning is carried out. The output of PID adjustment is analogical as well as digital and they can both be activated at the same time. The PID outputs are: Analogical Output 2 and Relay 1.

The PID function allows for all of the swings due to ON/OFF dosages to be eliminated. Furthermore, it allows for the threshold desired to be maintained and reached with extreme precision. The PID adjustment is a complicated adjustment that must take into account all system variables. This PID has been designed for those general applications with a fast retroactivity of the system. In reality, the maximum integral and derived times are 5 minutes.

The PID function allows for three adjustments to handle the dose.

The PROPORTIONAL (P) Adjustment allows for the outward dimension to be more or less amplified.

The DERIVATIVE (D) function allows for our system to become more or less reactive to variations of the sizes measured.

The INTEGRATIVE (I) function allows for the swings to be regulated due to the derivative part.

Description of functions:

**SET POINT**

The value of the PID threshold that we want to maintain stable.

**PID SETUP**

ALGORITHM

The kinds of algorithms handled by the instrument are: P = Proportional ; PI = Proportional – Integral and PID = Proportional – Integral – Derivative

The type of algorithm will be chosen according to the application requested. The P regulation will be set as a default.

THE ALGORITHM SIGN

In this function the PID sign is programmed. If we programme DIRECT it means that as the value measured is increased compared with the threshold defined, the PID value will decrease. However, if we programme OPPOSITE, as the value measured increases compared with the threshold defined, the PID value will increase. DIRECT is set as a default.

PROPORTIONAL

The Proportional Range of the PID regulation compared with the bottom of the scale for the instrument.

Eg. For a pH with a range of 0-14, if a 100% Proportional is programmed it means having a range of ±14pH of regulation compared with the threshold set. Therefore the value of the proportional is inversely proportional to the output, that is to say as the percentage of the proportional is increase the effects on the output decrease.

Regulation of the proportional may vary between 1 and 500% in steps of 1%. The default is set at 100%.

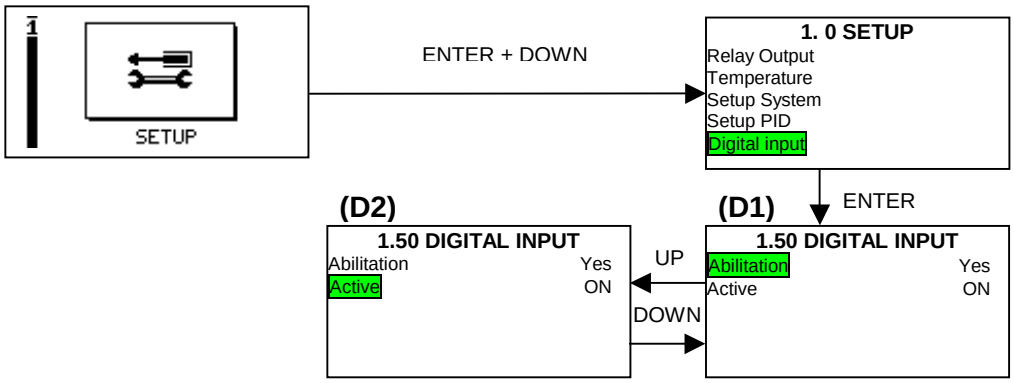
DERIVATIVE TIME

The Derivative part is set. The more the programmed time increases, the more the system will be ready for variations to the measurement. The derivative time can be programmed between 0 and 5 minutes at steps of 15 seconds. The default is programmed at 0 minutes.

INTEGRAL TIME

The Integrative part is set. The more the programmed time increases, the more the system will mediate with the measuring swings. The derivative time can be programmed between 0 and 5 minutes at steps of 15 seconds. The default is programmed at 1 minute.

### 4.3.4 SETUP MENU (DIGITAL INPUT)




**D1) Digital input: abilitation**

In this function it is possibile to activate the digital input. Setting “Yes” the digital input will be active.

**D2) Digital input: active**

In this function it is possibile to disconnect the set points.
Setting “ON” the set points will be disconnected when the input goes high.
Setting “OFF” the set points will be disconnected when the input goes low.

### 4.3.5 CALIBRATION MENU

This step of the programme is dedicated to calibration of the instrument with the electrode used. Calibration must be carried out:

- When starting the measure instrument / electrode chain the first time
- Every time the electrode is replaced
- When starting the instrument after a long inactivity period
- In the case of any discrepancies compared with the value of the buffer solutions

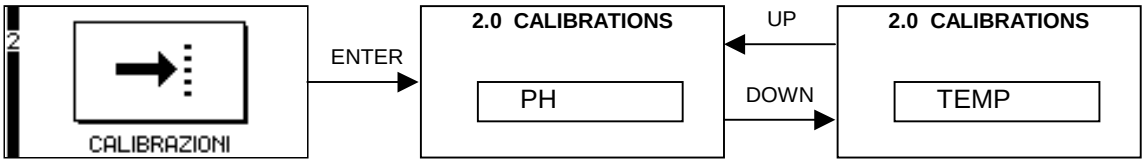
For granting a proper working, further to the above mentioned conditions, it will be required to check the calibration or to recalibrate the instrument periodically.

User will determine the frequency of this operation, keeping into account the application and the electrode used.

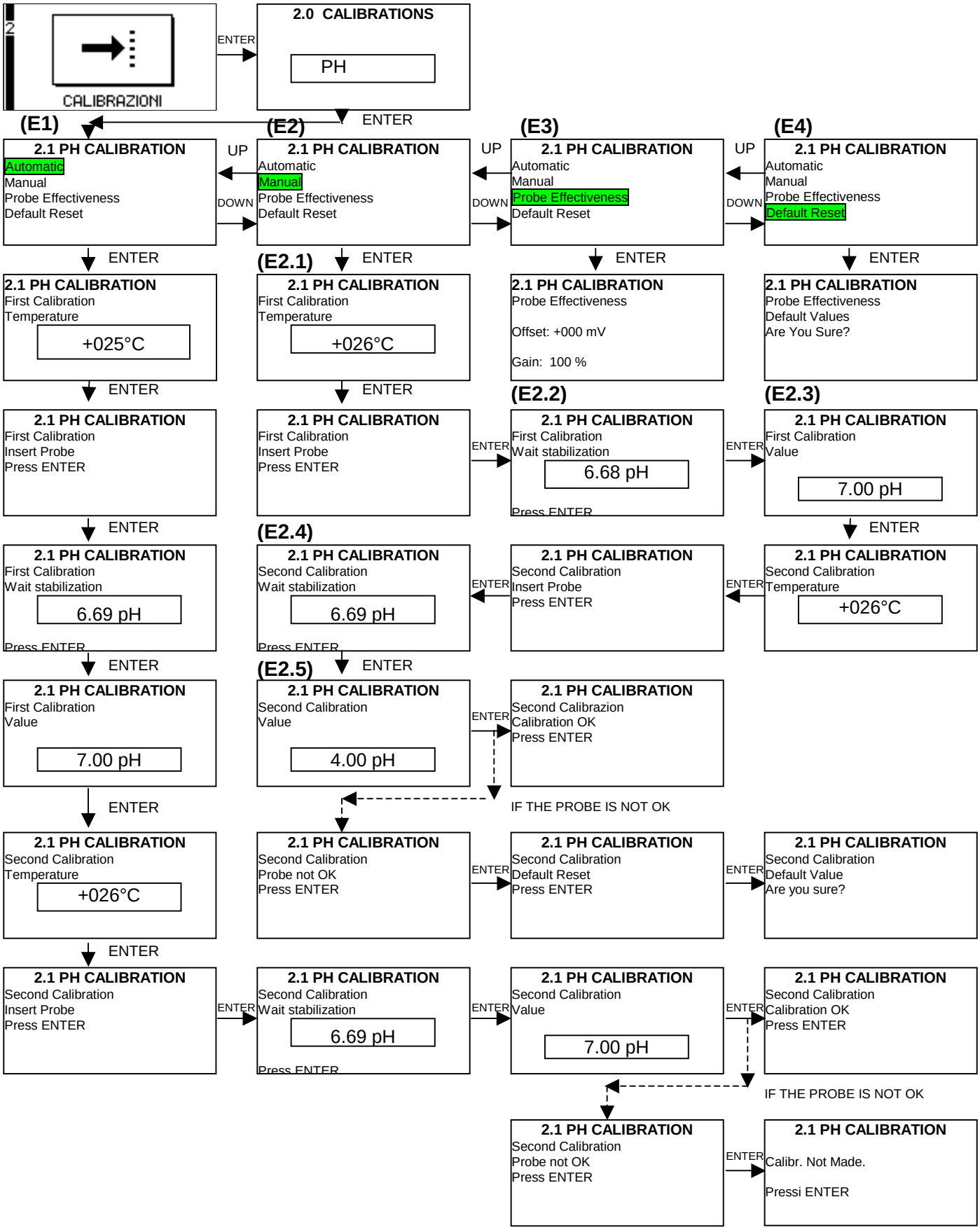
**NOTE**

**We remind you that before carrying out any checks or recalibrations, the electrodes must be cleaned thoroughly with clean water and fresh and reliable buffer solutions should be used.**

Description of the calibration functions:




From this menu it is possible to choose the type of calibration: pH/Rx or Temperature


2
CALIBRAZIONI
ENTER
2.0 CALIBRATIONS
PH
ENTER
(E1)
(E2)
(E3)
(E4)
2.1 PH CALIBRATION
Automatic
Manual
Probe Effectiveness
Default Reset
UP
DOWN
ENTER
(E2.1)
2.1 PH CALIBRATION
First Calibration
Temperature
+025°C
+026°C
2.1 PH CALIBRATION
Probe Effectiveness
Offset: +000 mV
Gain: 100 %
2.1 PH CALIBRATION
Probe Effectiveness
Default Values
Are You Sure?
(E2.2)
(E2.3)
2.1 PH CALIBRATION
First Calibration
Insert Probe
Press ENTER
Wait stabilization
6.68 pH
Press ENTER
Value
7.00 pH
(E2.4)
Second Calibration
Wait stabilization
6.69 pH
Press ENTER
Insert Probe
Temperature
+026°C
(E2.5)
Second Calibration
Value
7.00 pH
4.00 pH
Second Calibrazion
Calibration OK
Press ENTER
IF THE PROBE IS NOT OK
Probe not OK
Default Reset
Default Value
Are you sure?
Calibr. Not Made.
Pressi ENTER

**E1) Automatic**

The automatic calibration is very similar to the manual celibration described in the following lines; the main difference is that in this function the instrument is able to automatically recognize standard buffer solutions, assigning at the measured value the corresponding standard buffer value. The instrument can recognize the following standard buffer solutions: pH 7.00, pH 4.01, pH 10.00.

**E2) Manual**

The pH calibration includes two calibration points, while the Rx just one.

## pH calibration:

**E.2.1)** First calibration must be carried out using pH7 buffer!! After inserting the temperature compensation value of the calibration solution (if the NTC probe is connected, the temperature will be read automatically) press the ENTER key and dip the pH electrode into the pH7 buffer solution, then press the ENTER key once again.

**E.2.2)** Wait till the displayed value read by the probe stabilizes, then press the ENTER key.

**E.2.3**) The instrument automatically recognises the solution and display the pH7 buffer value; press the ENTER key.

**E.2.4**) and **E.2.5**) Carry out the second point calibration as with the first one. In this phase, acid buffers (pH4) or alkaline buffers (pH9) can be used; the instrument will recognise them automatically. pH buffers different from 4 or 9 can be also used by modifying the buffer value displayed by pressing the UP and DOWN keys.

**For choosing between acid and alkaline buffer, please refer to the probe working range, i.e.: if the working range is between 4 and 8 pH, use a pH4 as the second calibration point**.

Once the calibration of the second point has been completed, the instrument will control the calibration data consistency and if everything is Ok the message “Calibration OK” or “Correct probe” will be displayed on the instrument.

If the calibration is correct, the probe Effectiveness values will be displayed on the instrument.

If ”Faulty Probe” is displayed, we recommend:

- To check the electrode physical integrity and the protection cap removing
- To assure the cleaning of the porous plug, if not, dip the electrode into a regenerant solution (Chloridric acid 3-4% solution ) for some minutes
- To check the cable integrity, the correct connection to the instrument and on the electrode.

## Rx calibration:

After inserting the calibration solution temperature compensation value (if the NTC probe is connected the temperature will be read automatically), press the ENTER key and dip the Rx electrode into the calibration solution, then press the ENTER key once again.

Wait till the displayed value, read by the probe, stabilise, then press the ENTER key.

The instrument will automatically display a value in mV which may be modified in relation to the value of the solution used, by pressing the UP or DOWN arrow. Press the ENTER key.

The instrument will then verify the calibration data. If they are correct, the message “Calibration OK” will be displayed, otherwise the message “Faulty Probe” will be shown.

If the calibration is correct, the Probe Effectiveness value will be displayed on the instrument.

If ”Faulty Probe” is displayed, we recommend to complete the controls as per the pH electrode.

**E3) Probe Effectiveness**

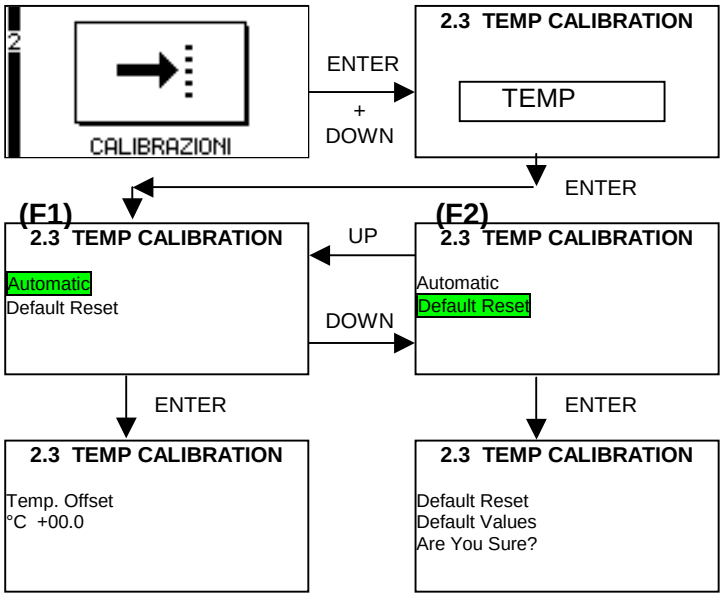
These parameters inform the user about the pH or Rx probe and refer to the latest calibration.

As to the pH probes, when the OFFSET value is above ±100mV and the Gain falls to below 50%, it means that the electrode needs to be regenerated or replaced.

As to Rx probes, when the OFFSET value is above ±100mV, it means that the electrode needs to be regenerated or replaced.

**E4) Default Reset**

This programme step allows for the calibration factors to be reset to the original factory ones. To be used when incorrect calibrations are confirmed.



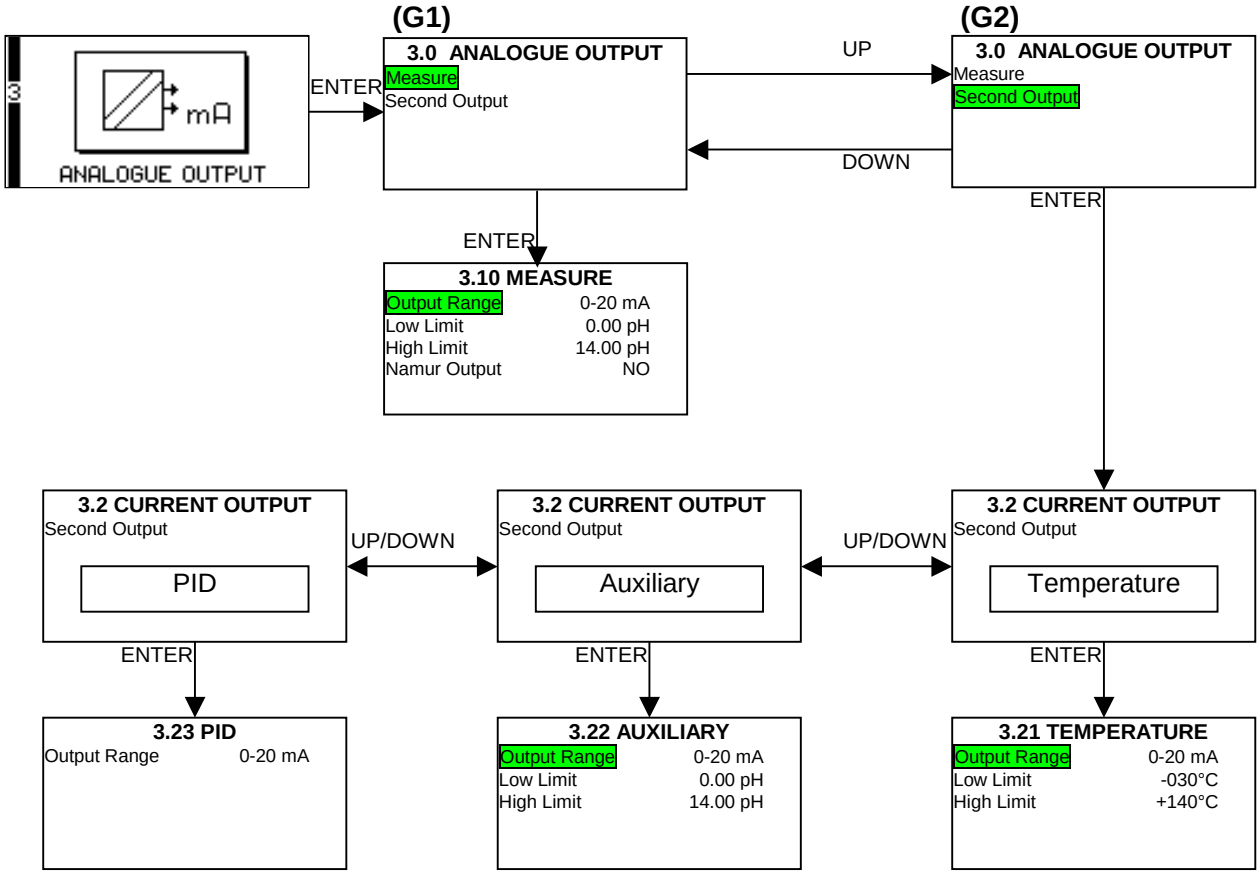

First, turn the instrument on pressing both UP-DOWN buttons: now the instrument allows to choose the temperature sensor from PT100/PT1000/NTC; once the choice is done, press ENTER to confirm.

The temperature calibration allows to align the values detected by the sensor to the real analysis values; this step must be done only if the operator found some differences between the detected values and the real working values.

**F1) Automatic Calibration**

In this function is possibile to add or remove an offset in order to restore the correct temperature’s value.

### 4.3.6 ANALOGUE OUTPUT MENU




The instrument is fitted with two analogical outputs in a current that is separated galvanically and are independent of each other. The first output refers to the primary measuring therefore proportional to the pH or Rx measured. The second, however, can be programmed between Temperature, Auxiliary or PID.

**G1) Measuring**

In this step of the programme 4 functions can be set:

**OUTPUT RANGE:**

A selection can be made between 0-20mA or 4-20mA. The default is programmed at 0-20mA

**LOWER LIMIT:**

A pH or Rx value at 0 to 4mA of outward current can be set. The default is set at 0pH o –1500mV

**UPPER LIMIT:**

A pH or Rx value of 20mA can be set for outward current. The default is set at 14pH o +1500mV

The regulation of Lower and Upper Limit functions allow for the scale of analogical outputs to be amplified. Furthermore, the output can be inverted to 20-0mA o 20-4mA

**NAMUR OUTPUT:**

This function is only activated if chosen as an Output Range of 4-20mA. If this function is activated in the case of an alarm, the outward value of the current will be 2.4mA according to the NAMUR standard. The default of this function is deactivated.

**G2) Second Output**

The second output can be set as Temperature, Auxiliary or PID.

If set as **Temperature** a Range between 0-20mA or 4-20mA can be chosen, the Lower and Upper limits of the Temperature value. For a detailed description of how to set them, refer to point 5.1 Measuring of Analogical Output. The default Range is 0-20mA, the Lower Limit is –30°C and the Upper Limit is +140°C.

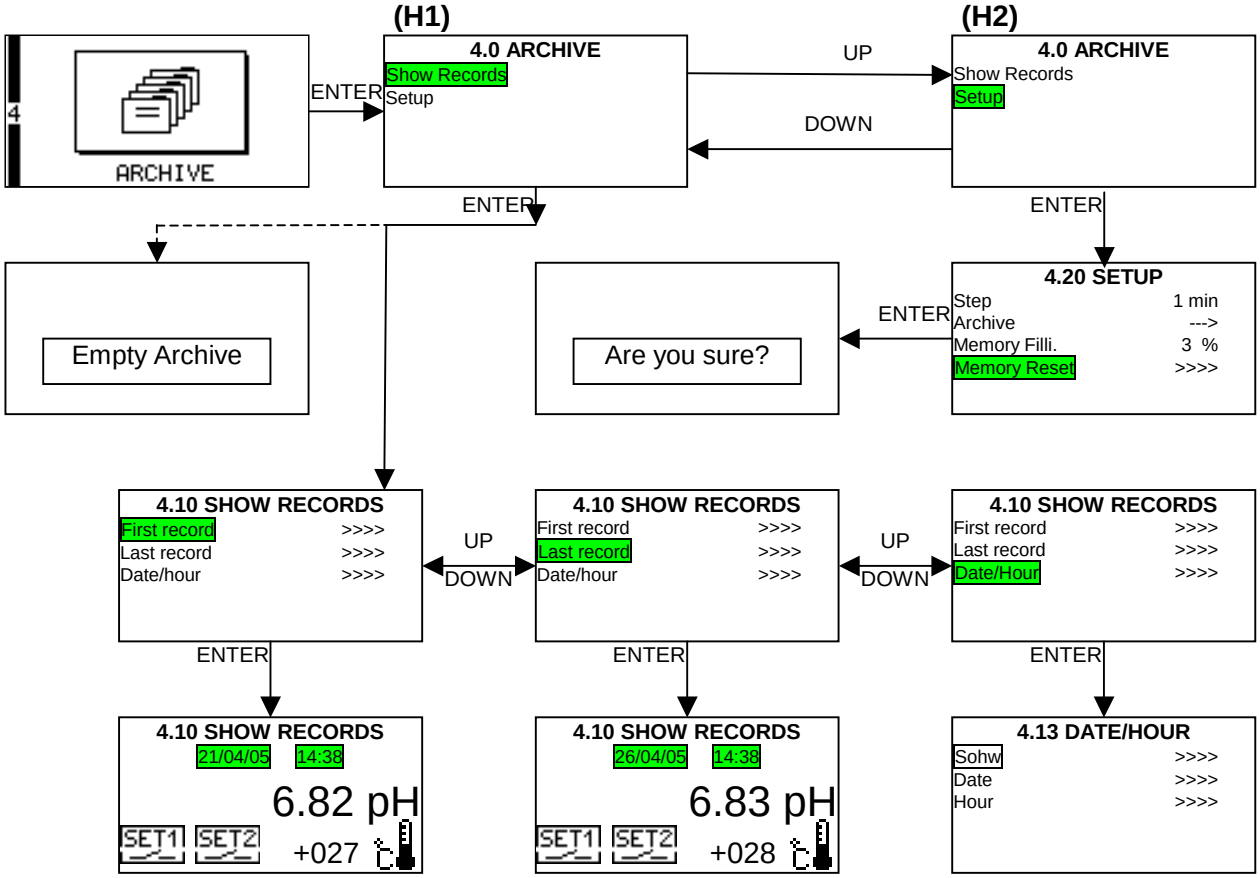
If set as **Auxiliary** on the second output also, the pH or Rx measurement is repeated. But the Range of between 0-20mA or 4-20mA, the Lower limit and the Upper limit of the pH or Rx values can be chosen, different to the previous ones. For a detailed description of how to set them refer to point 5.1 Measuring of Analogical Output. The default Range is 0-20mA, the Lower Limit is 0pH or –1500mV and Upper Limit is 14pH or +1500mV.

If set as **PID** the Output Range of between 0-20mA or 4-20mA must be set. For settings of the PID see part C3.

### 4.3.7 ARCHIVE MENU

The instrument is fitted with a Data Logger that allows for 16,000 records to be stored. Each record contains: the date, the time and the pH or Rx value, the temperature value, the value of the Threshold 1 and 2, the state of the Relays 1 and 2 and the state of the Alarm Relay. The archive must be of a Circular kind, therefore once filled the next data will overwrite the oldest one and so on until it is completely FILLED, that is to say once it is filled storage is blocked and the full archive icon will appear.

The archive can be examined directly through the instrument in the form of a table or drawing. The archive may be downloaded using a serial port.



**H1) Visualise data**

In this part of the programme it is possible to visualise data in the form of a table as long as the archives are not empty. In order to decide on where to start and examine the table, there are three options:

First Data >>> You will start by examining the archive of the first data stored and move forward

Last Data >>> You will start by examining the archive of the last data stored and move backwards

Date/Time>>> You will start by examining the archive from a specific date and time

In order to move backwards and forwards use the UP and DOWN keys and once you reach the first or last data it will stop.

**H2) Set-up**

In this part of the programme the storage parameters are set using 4 functions:

**STEP**

It indicates the registration step and it can be programmed at between 0 and 99 minutes. The default is 0 minutes, therefore deactivated, and it can be increased by 1 minute at a time.

**ARCHIVE TYPE**

Circulation of "⇦" of the Archive once it is full and it will write over the first data

Filling "--⇨" Once it is full it will stop storage

**SPACE USED**

It indicates the amount of memory used up by the data stored.

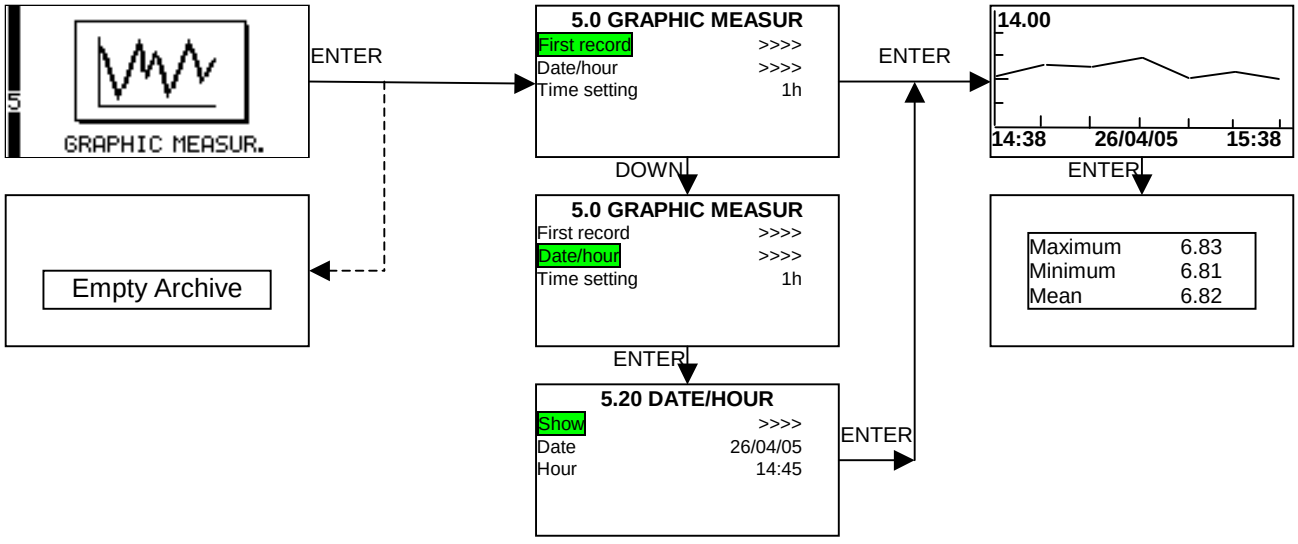
MEMORY RE-SET

It is used to clean the memory.

**CAUTION**

**Once this operation is carried out all measurements stored will be lost.**

## 4.3.8 MENU OF MEASURING GRAPHICS



In this step of the programme you can see data in a graphic form, as long as the archive is not empty. In order to decide from where to start to examine the graphics and tables, there are two options:

First Data >>> You will start by examining the archive of the first data stored and move forward

Date/Time>>> You will start by examining the archive from a specific date and time

In order to move backwards and forwards use the UP and DOWN keys and once you reach the first or last data it will stop.

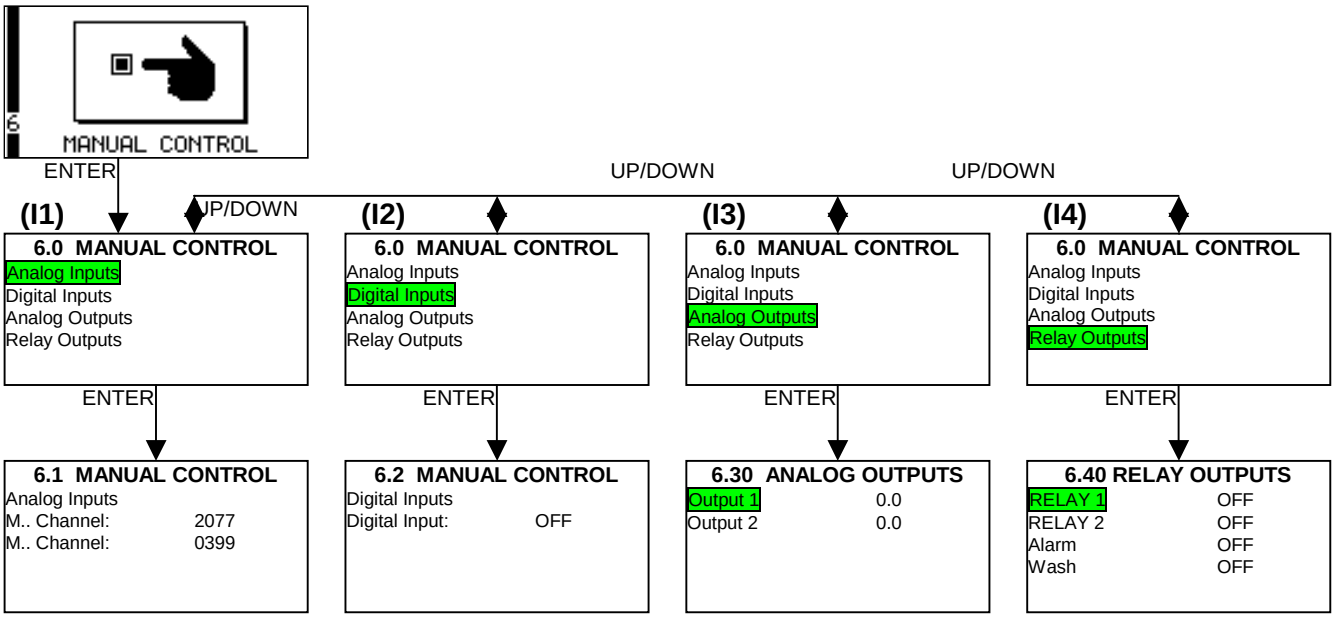
**The Times item indicates for how many hours we want to visualise the drawing. The default is 1 hour but we can choose from 1, 6 or 24 hours.**

**NOTE**

**Once the drawing is visualised, if the ENTER key is pressed a table will appear indicating the Minimum, Maximum and Average value of the measurements visualised on the screen. Furthermore, if the ENTER key is pressed again, a ZOOM of the data visualised will appear. If the ENTER key is pressed again, it will return to the initial visualisation.**

The ZOOM allows for a clearer evaluation of small pH or Rx valuations.

### 4.3.9 MENU MANUAL CONTROL




This step of the programme is useful for all functional controls eg. Upon installation to check functioning of the entire system.

**I1) Analogical Inputs**

This function allows for the values read by the digital analogical converter related to the pH or Rx and temperature measuring to be seen directly.

This allows you to understand if the level of analogical acquisition of the instrument works correctly.

**I2) Digital Inputs**

The instrument is fitted with a passive digital input, separated galvanically, which allows for the doses to be deactivated, on the Relay and also on the Analogical Outputs. This step allows you to check whether or not the digital input of dosage deactivation works correctly. If it is Open it must

indicate OFF and if, however, tension is applied to the clamps, according to specifications, the instrument should indicate ON.

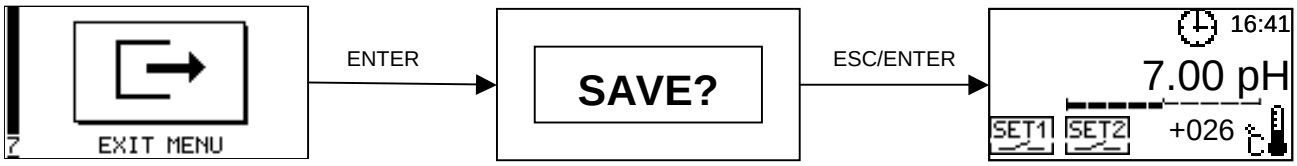
**I3) Analogical Outputs**

It allows for manual simulation of both the Analogical Outputs under current. The variations of the outputs have a pass of 0.1mA.

**I4) Relay Outputs**

It allows for manual activation of the Relay Outputs.

### 4.3.10 MENU "EXIT MENU"

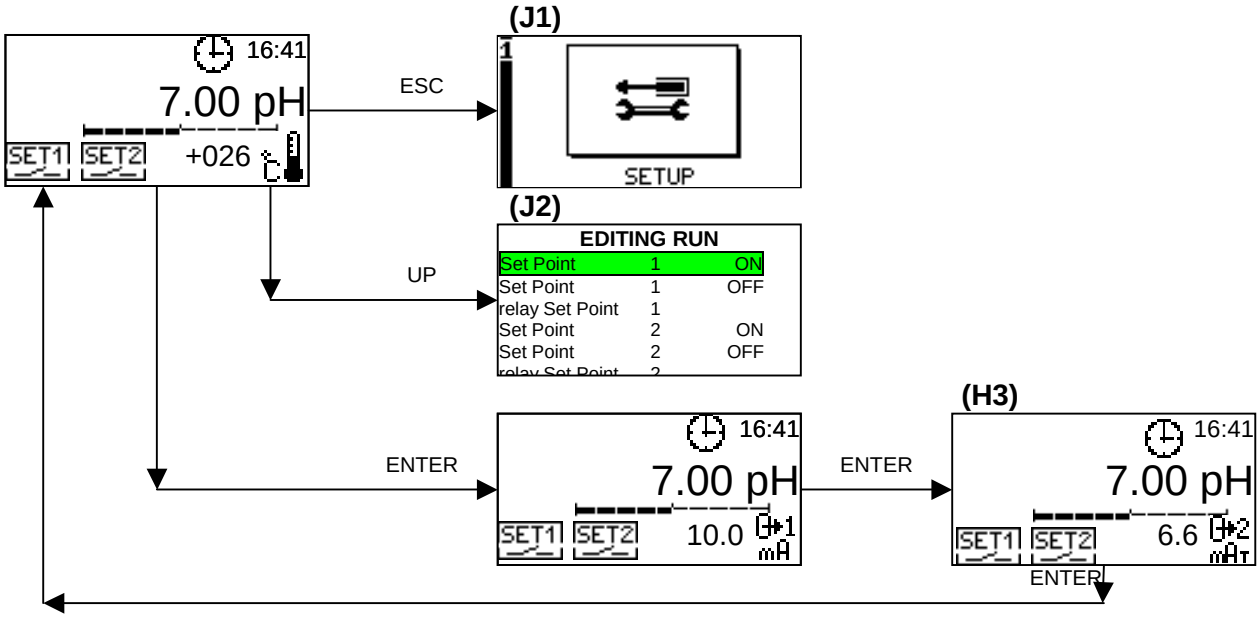



Leaving the menu allows you to return to the RUN method. Before returning to the operative method and saving all programming carried out in a stable manner, the instrument will ask for confirmation. If the ENTER key is kept pressed down, the instrument will save all programming on EEPROM and will return to its operative status.

**CAUTION**

**If the ESC key is pressed, the instrument will return to its operative states and will not save the modifications made but it will recover the previous ones. Therefore all modifications will be lost.**

### 4.3.11 FUNCTIONS IN RUN




In the RUN screen the following things can be seen:

- pH or Rx measuring
- the point in which it is operating

- the system time
- the status and type of programming of Relays 1 and 2
- Status of Digital Input
- Status of the Alarm Relay
- Status of the Washing Relay
- Status of the Password
- Status of measuring and output freezing
- Value of the Temperature or of the Analogical Output 1 or of the Analogical Output 2
- System errors
- Storage of Data in the Archive
- Archive Full

**J1) Pressing the ESC key**

By pressing this key you will enter the Instrument Programming stage and all measuring and dosage functions will be deactivated. Caution: the instrument will not leave this stage automatically and therefore if it is left in the Instrument Set-up it will never carry out any operation.

In the Instrument Set-up stage, serial communication is also deactivated.

**J2) The UP key**

It allows for programming of the Set Point 1 and 2 thresholds without stopping the instrument and therefore stopping the pumps. Furthermore, it is also possible to pilot Relays 1 and 2 manually and without blocking the system.

**J3) The ENTER key**

It visualises the value of Temperature of the value of the Analogical output 1 or the value of the Analogical output 2 at the bottom of the display.

# 5 USER MAINTENANCE

## 5.1 SPECIAL CAUTIONS FOR CRITICAL COMPONENTS

An LCD (Liquid Crystal Display) is incorporated into the equipment and it contains small amounts of toxic materials.

In order to avoid damages to people and to limit the negative effects on the environment, comply with the following instructions:

**Display LCD:**

- The LCD display of the electronic gear case is fragile (it is made of glass) and therefore should be handled with extreme care. For this reason we recommend that the device is protected in its original packaging during transport or when not in use.
- If the glass of the LCD breaks and liquid spills out, make sure that you do not touch it. Wash every part of the body that may have come into contact with the liquid for at least 15 minutes. If, once this operation has been carried out, you notice any symptoms consult a doctor immediately.

# 6 CORRECTIVE MAINTENANCE

Switch the machine off for every kind of operation

## 6.1 REPLACEMENT OF FUSES

The 500 mA-T fuse located alongside the supply clamps should only be replaced with fuses of the same value, on the contrary you may risk causing irreparable damage to the device.

The fuse supplied has been calculated according to the maximum absorption of the system and it must jump immediately when project characteristics are varied.

When, after replacement, it is necessary to replace the fuse once again, check the cables and/or the correct value of the fuse itself.

# 7 LIST OF SPARE PARTS FOR REPLACEMENT

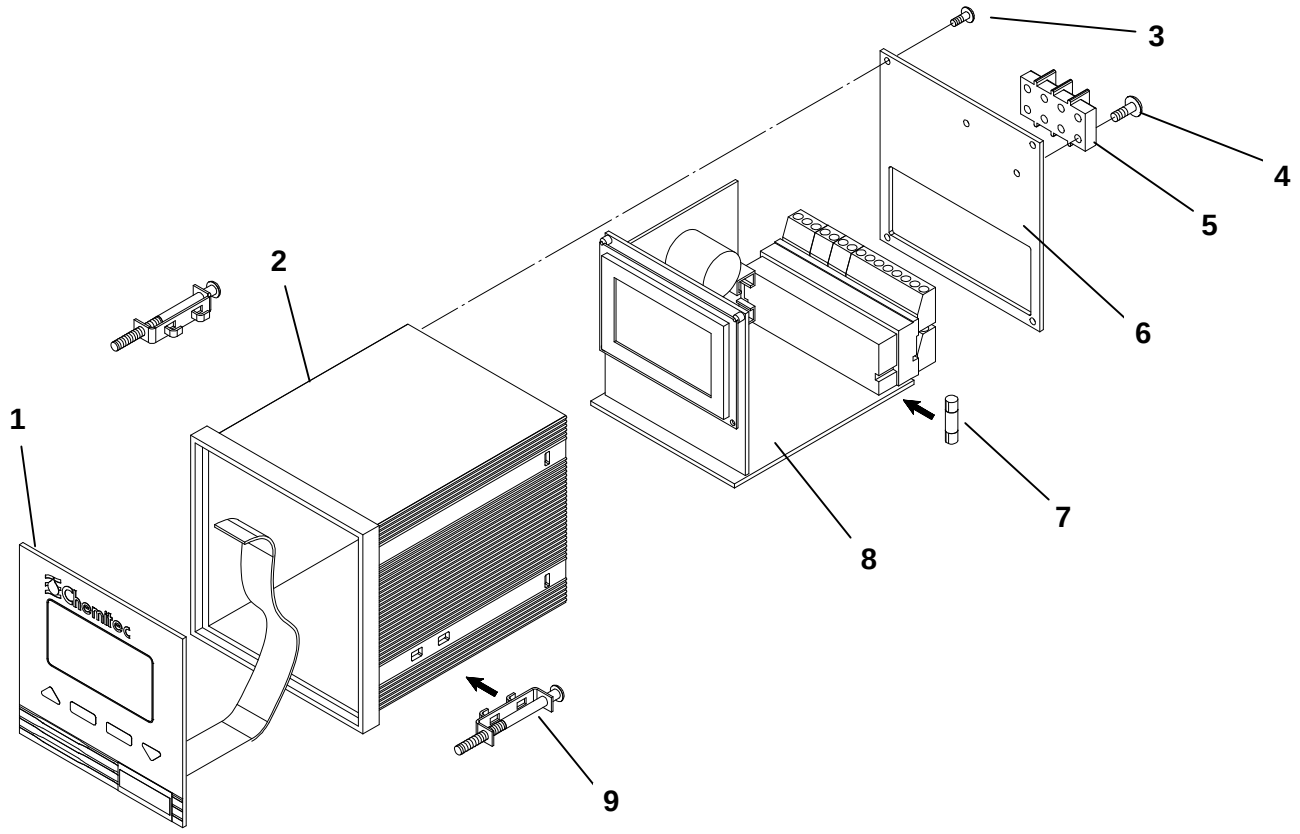



**Figure 15 Replaceable parts - Mod.4037 from the panel**

**Table 1 List of replaceable parts - figure 16**

| REF | P/N | DESCRIPTION |
|---|---|---|
| 1 | | Front panel with keyboard |
| 2 | | Plastic container |
| 3 | | TCEI 2.9x9.5 stainless steel screws |
| 4 | | TCEI 3x10 stainless steel screws |
| 5 | | High impedance terminal board |
| 6 | | Rear panel |
| 7 | | Fuse |
| 8 | | Electronics assembly |
| 9 | | Board fixing bracket |

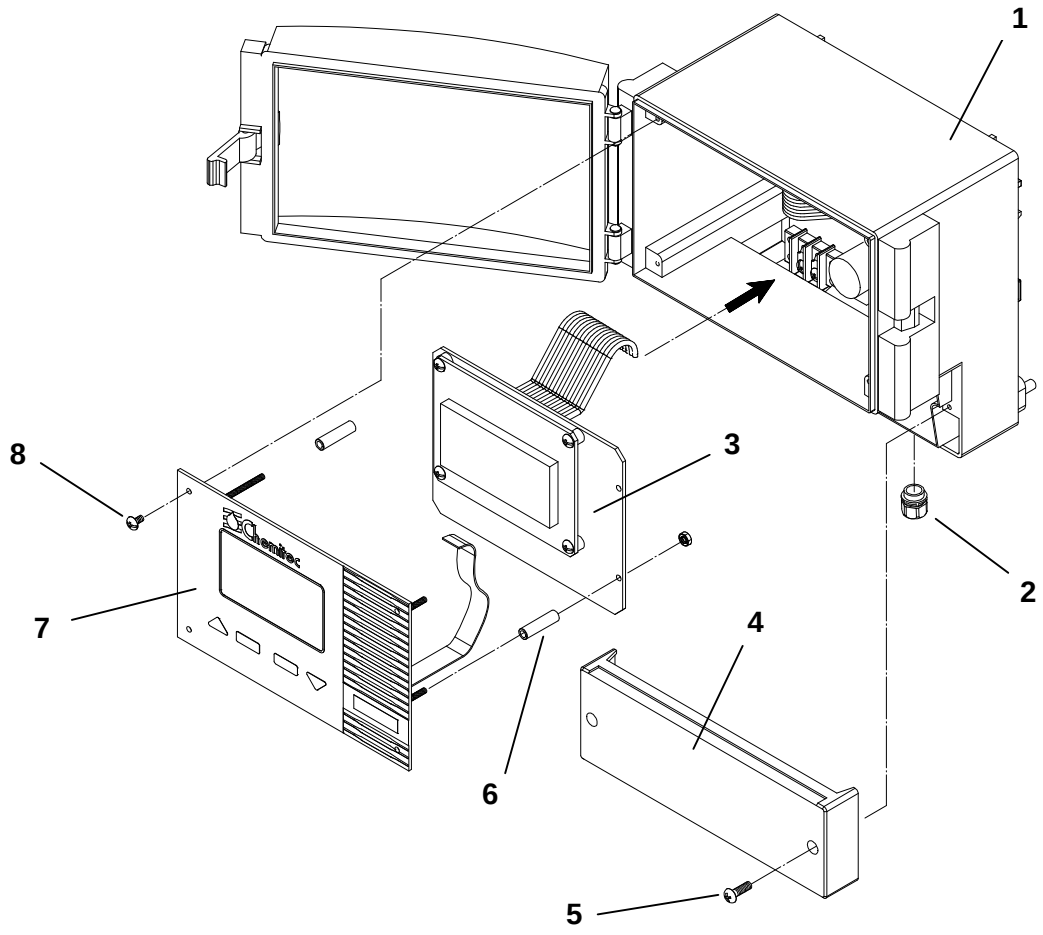



**Figure 16 Replaceable parts - Mod.4037 wall type - (First part)**

**Table 2 List of replaceable parts - figure 17**

| REF | P/N | DESCRIPTION |
|---|---|---|
| 1 | | ABS container |
| 2 | | PG9 or PG11 fairlead |
| 3 | | Electronic cards |
| 4 | | Terminal board container cover |
| 5 | | TCEI 4,5x25 stainless steel screws |
| 6 | | Brass cylindrical column |
| 7 | | Front panel with keyboard |
| 8 | | TCEI 2,6x9,5 stainless steel screws |
| | | |

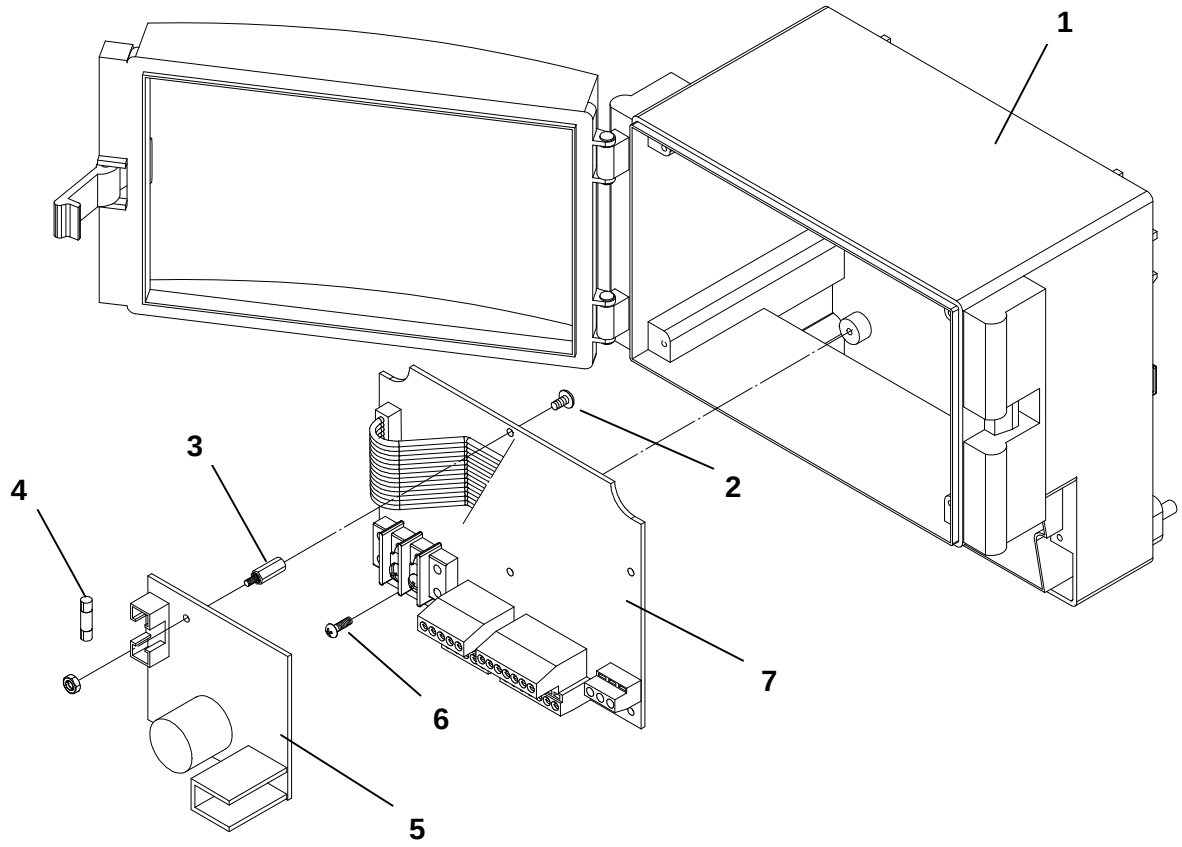



**Figure 17 Replaceable parts - Mod.4037 Wall type - (First part)**

**Table 3 List of replaceable parts - figure 18**

| REF | P/N | DESCRIPTION |
|---|---|---|
| 1 | | ABS container |
| 2 | | TCEI 3x10 stainless steel screws |
| 3 | | Hexagonal spacer – 15 mm |
| 4 | | Fuse 3.15° |
| 5 | | Power supplier electronic card |
| 6 | | TCEI 2,9x6,5 stainless steel screws |
| 7 | | Electronic card |
| | | |
| | | |

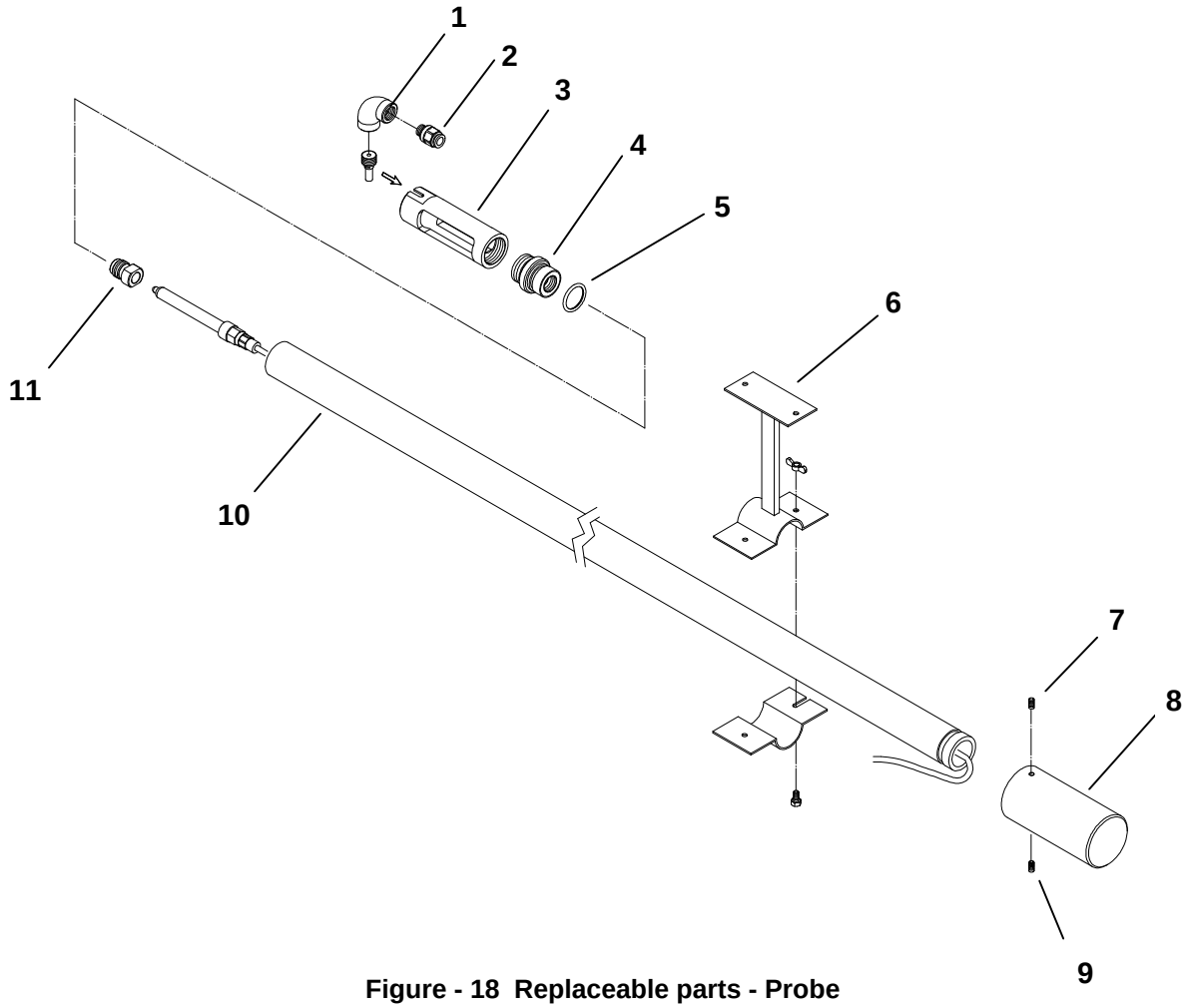



**Figure - 18 Replaceable parts - Probe**

**Table 4 List of replaceable parts - figura 19**

| REF | P/N | DESCRIPTION |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |
| 11 | | |